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DISCUSSION PAPER SERIES

IZA DP No. 17276

Impact of Stock Market Manias and Panics on the U.S. Labor Market

Douglas Mwangi Waithaka
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Douglas Mwangi Waithaka
ZHAW School of Management and Law

Michael J. Kendzia
ZHAW School of Management and Law and IZA

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IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Impact of Stock Market Manias and Panics on the U.S. Labor Market

History teaches valuable lessons. This article examines the performance of the stock market during various boom and bust phases over the last forty years in the United States. By doing so, four previous manias and panics scenarios are analyzed, including the 1987 black Monday crash, the Dotcom bubble in the early 2000s, the 2008 financial crisis, and the 2019 Covid pandemic. At the same time, the unemployment rate, the growth domestic product (GDP) per capita growth rate, the conference board's leading economic index and the wages growth rate are considered. Econometric models were finally used to study the markets relationships. The study finds that the labor market lags the stock market during manias and panics, supporting the hypothesis of a delayed response in the labor market. The unemployment rate reacted particularly late to the black Monday crash, the Dotcom bubble and the 2008 financial crisis. The leading economic index followed the stock market closest and with the slightest lag. Wages growth rate and the growth domestic product per capita growth rate reacted with varying degrees to each mania and panic episodes.

JEL Classification: B23, B27, E24, G15

Keywords: S&P 500, leading economic index, wage growth rate, unemployment rate

Corresponding author:
Michael J. Kendzia
ZHAW School of Management and Law
St.-Georgen-Platz 2
8400 Winterthur
Switzerland

E-mail: kend@zhaw.ch

1. Introduction

The stock market's health is crucial for law and policy makers, who make decisions based on how good or bad its performance is. Subsequent stock market bubbles that have historically formed due to investor enthusiasm can have a devastating domino effect on other sectors when they drastically burst. Therefore, it is crucial to understand stock market fluctuations. This article seeks to understand the performance of the stock market over various boom and bust phases by use of market indicators such as the Standard and Poor's 500 (S&P 500) and reveal how these phases impacted the United States (U.S.) general labor market.

The S&P 500 index derived from value-weighting the 500 largest stocks in the U.S. in terms of market capitalization. It can be used to analyze the stock market due to its general representativeness, as it represents nearly 80% of the entire economic market in the U.S. Equivalently, the Wilshire 5000 value weights 5000 stocks in the U.S., thus covering most of the stock market, but its returns correlate to those of the S&P 500. The Russell 2000 is not used due to its focus on 2000 mostly small market capitalization stocks in the market and is less representative of the entire economy in comparison to the S&P 500. The Dow Jones Industrial Average (DJIA) on the other hand, despite being the oldest stock market index, only represents 30 stocks from the industrial sector and is therefore not adequate to showcase the entire economic market. Additionally, the DJIA index analyzes these stocks by means of price weighting, meaning it holds an equal number of shares of each stock, but assigns more weight to those with higher stock prices implying rebalancing is necessary in the face of price changes as opposed to in value weighing, as is the case of the S&P 500 (Berk & DeMarzo, 2017).

This article aims to demonstrate that the stock market precedes the labor market's performance, whose indicators lag that of the stock market during its various boom and bust phases.

2. Theoretical framework

Manias and panics scenarios

Kindleberger (1978a) defines stock market manias as *a loss of touch with reality something close to mass hysteria*.

He associates manias with euphoric spending and investment in stocks from households and investors, which then leads to rapid economic growth rates and as a result spurs on investors to be more optimistic towards future returns on stock investments, further driving and increasing their buying frenzies. Subsequently, firms are also not left behind and increase their investments, fueled by easy to acquire credit that leads to a surge on the stock prices. He asserts that in manias, asset prices rapidly increase with no middle point. A bubble follows after the mania fueled boom characterized by what (Rapp, 2015) calls *momentum buying* to signify stock purchases made by speculators with disregard to the underlying real worth of the organization. Kindleberger (1978a) defines bubbles as prices that continue to rise steadily with no fundamental explanation for a long period of fifteen to forty months and later explode. Stock prices keep on rising, more investors are sucked into the bubble, which promotes its inevitable unsustainable peak.

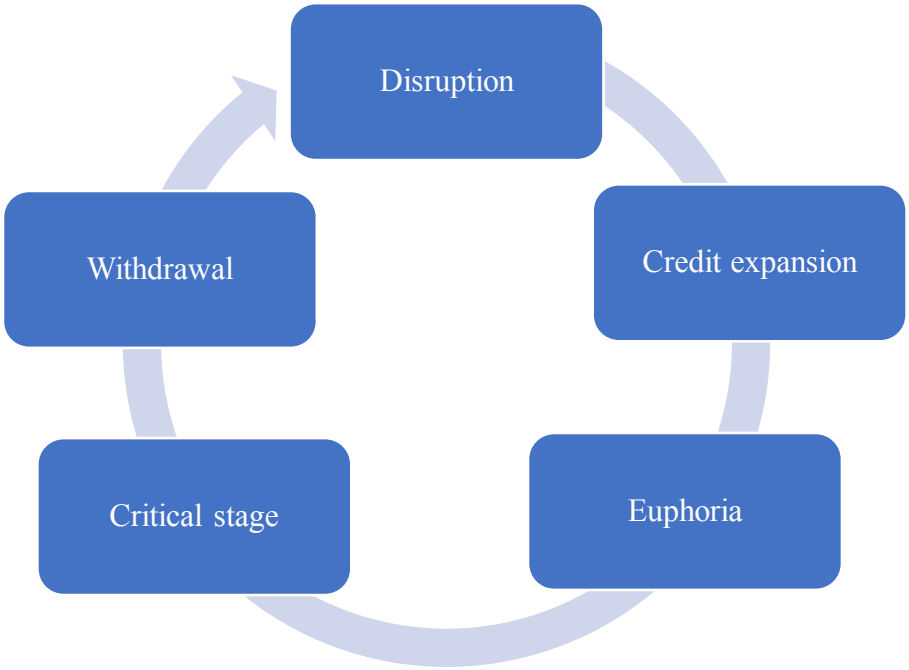
During bubbles, the industrial economy fares well, there is steady low unemployment, ample economic growth and general optimism. In addition, low interest rates and widespread overleveraging can be observed (Galbraith, 1993).

Kindleberger (1978a) notes that panics ensue when asset and stock prices hit the ceiling, which is followed by a change in perception and fear sets in that they will decline more. The same investors who bought during the mania phase worry that they will lose their investments and begin selling them off in order to mitigate their loses. This heavy selling leads to commodities losing their value by around 30 – 40 % from when they were at their peak. Then there is a slowdown in the economic sector, which then cascades to other sectors such as the labor market and unemployment increases.

Manias and panics scenarios evolution

Kindleberger (1978a) proved that the steps of manias and panics can be classified into five stages. Namely from disruption to credit expansion, to euphoria, to critical stage and finally to withdrawal, as illustrated in **Figure 1** below.

Figure 1: Five stages model of manias and panics



During the *disruption* or catalyst stage, he argues that an external shock to the macroeconomic system such as new technological advancement or inventions, foreign exchange regulations, wars, or monetary policies increases profit making anticipation for investors. Thus, investors borrow heavily to seize on this opportunity that would be multiplied by making numerous investments.

Next, the *expansion of credit* to investors follows by financial institutions such as banks. The freely available capital in form of credit, leads to a compelling increase in the demand for goods and services and for stocks. After a while, the increased demand leads to price rises and simultaneously to profit growth for early investors, leading to the next progressive stage *euphoria*.

The euphoria stage arises from the ever-rising capital gains growth and is associated with an intensification in speculation on prospective stocks price increases. He defines speculation as the buying of stocks for the sole purpose of reselling them at a higher price later, contrast to buying them for investment. Financial institutions increase their leverage – ratio of debt to equity, to further fuel the euphoria. More investors are lured into the speculative frenzy, especially after seeing other investors make profits, leading investors away from rational purchases in what he refers to as mania episodes.

The *critical stages* kicks in and those investors that got in earlier during the disruption stage, start selling off their investments at a faster pace than there are buyers. The leveraged investors are forced to sell their stocks once a sharp selloff occurs, mainly because their assets are then worth less than at their initial buy price. A panic ensues once investors cannot get buyers of their assets at the same price as during the *euphoria* and credit creation stages. An indicator of the end of the speculative sentiment may be signaled if then, a financial institution or firm goes bankrupt, accelerating the number of investors selling their investments even more. As the investment sentiment turns gloomy, the next stage of withdrawal creeps in.

The *withdrawal* stage is marked with a lot of panic and little investor optimism regarding another rise in prices. The panic to get rid of initial investments reduces available liquidity to purchase assets even at lower prices as investors seeks to mitigate their losses.

1987 Black Monday market crash

Monday 19, October 1987, saw the biggest one-day stock market crash in the U.S., surpassing the 1929 Great Depression levels. The S&P 500 experienced a decline of 57.86 points, a 20.46 percentage drop, its largest percentage drop in that era (McKeon & Netter, 2009). After a great bull run or massive gains in the values of individual stocks and the S&P 500 that had gained 170% from early 1982 up until the late 1980's. According to Rapp (2015) the stock market peaked in 1987, prior to the black Monday flash crash. The roots of the 1987 crisis have many theories, such as due to excessive credit lending, a rise in speculation, and risk-taking that was driven by the moral hazard created by deregulation and taxpayer bailout guarantees. The popularity of arbitraging aswell as programmed trading, meaning the action of buying stock indices as their value went up and then gradually selling the same indices when their prices started going down, might also have contributed to the crash.

The disruptive factor for this mania among others was mainly due to news, that the U.S House Ways and Means Committee, would pass a bill to end the ability to deduct debt which has been used to finance firm takeovers, from the purchasers' tax returns. This news caused merger arbitragers to sell their positions en masse.

The selling positions were not all executed on Friday the 16th of October and upon their eventual execution on Monday the 19th of October, the selling pressure imbalance being too extensive caused the S&P 500 to drop massively (McKeon & Netter, 2009).

The panic led to stock trading halts for some assets - due to increased selling volumes that outweighed the volume of buyers in the market, leading to inefficient liquidity in the market and causing the massive drop in stock prices (Gammill & Marsh, 1988).This drop fueled panic that was also felt in other markets.

The 2000's Dotcom Bubble

The Dotcom bubble derives its name from the domain ending COM to signify telecommunication companies (Kohn & Valls Pereira, 2017). According to Fransman (2004), the Dotcom bubble was triggered by the wide scale introduction of the newly developed technology Internet, that then led to the relaxation of regulation pertaining to the telecommunication market, as from the period of 1995 – 1997. Due to what Fransman (2004), refers to as a *beauty contest* to describe how telecom shares were priced. Not according to their book value, but rather in terms of how it was deemed investors would perceive their worth. This had the effect of the prices for most telecom company shares being quite high, despite having no underlying fundamentals to support the evaluations. Morris & Alam (2012) note that companies that had no previous returns, had astronomically high stock prices that ignored fundamental financial information.

Additionally, Kohn & Valls Pereira (2017), mention that the expectations, that the internet technology would increase the company's future profits due to its increased internet induced productivity, also influenced pricing in the mania phase.

Subsequent fear of missing out on investment opportunities, investors seeing an increase in share prices and revenues from telecoms equipment supplying companies, joined in the mania from 1997 to the early 2000's. Eventually, the discrepancy between the stock prices of these telecom companies and their performances showed. This was followed by a decline in share prices and investors started selling these shares to minimize the incoming persistent decreasing worth of their held shares. Panic selling ensued, continuing all the way to 2003 when the Dotcom bubble collapsed (Fransman, 2004).

The 2008 financial crisis

The financial crises of 2008 effectively begun in 2007 in the U.S. and spread from there to both advanced and emerging economies to become the most severe financial crisis since the Great Depression (Claessens et al., 2009). The crisis had a drastic spillover effect to the general economy.

The 2008 crisis started as a real estate mortgage bubble and dominoed to the financial and banking sector causing the loss of over 8 trillion U.S dollars from the peak in 2007 to the burst in 2008 (Brunnermeier, 2009). According to Gwartney and Connors (2009), during the mid-1990s, there was a shortage of funds for mortgages. Hence to increase the number of home owners, mortgage lending was reregulated to make loans available for home buyers (Gwartney & Connors, 2009).

The disruption stage started with the introductions of new mortgage loan *originate and distribute* models that enabled banks to repackage and redistribute their own loans to borrowers to other financial investors by the creation of structured products or collateralized debt obligations (CDO). Buyers of CDO's then bought credit default swaps (CDS) insurance contracts to protect the CDO risk baskets against potential defaults Brunnermeier (2009). Due to the repackaged CDO's, mortgage financing and general loans became cheaper and were freely offered on the premise that the value of real estate would keep rising indefinitely. Hence a housing bubble was formed in the resulting lending euphoria. The critical stage came about when the baskets risk levels started getting downgraded by rating agencies, thus making their CDS insurance more expensive and the baskets less valuable. To avoid having too many cheap and risky assets, investors started offloading the CDO's. Lending institutions who were both buyers and sellers of CDO's and CDS's faced liquidity imbalances. Consequently, these financing institutions had to result to injecting funds to avoid margin calls and acquiring lending funds became a severe problem. Eventually, lending pools started drying up and a bank run was on as many CDS's could not be guaranteed.

Bankruptcy of banks and mortgage institutions was the final nail on the coffin and saw corporate shares prices aswell as new home sales plunge to signal the begin of the panic phase. The U.S. government had to intervene, and it did so by the use of fiscal and monetary policies to curb the crisis.

To do so, corporate and banking bailouts as well as an economic stimulus package to support the failing economy were initiated (Katkov, 2012). The failure of the finance and banking sectors had repercussions to all sectors in the economy. As a result, consumer as well as business confidence declined causing mistrust on future policies and economic recovery that lasted many years (Raddant & Wagner, 2016).

The 2019 Covid pandemic

The coronavirus pandemic (Covid) begun in the final months of 2019 in the city of Wuhan (Hubei region) and rapidly spread across the globe. To the effect that, by early 2020 millions of infection cases were registered and thousands had lost their lives across the entire world (Akhtaruzzaman et al., 2021).

The financial market was also heavily affected, to the extent that circuit breakers, meant to prevent surges in the stock market were activated four times in the month of march 2020 for the U.S. stock market, which were last triggered once in 1997. Thus, the coronavirus occurrence was the disrupting catalyst for the soon to brew panic, that was supervened by a mania. To combat the financial meltdown, the U.S. federal bank lowered the interest rate to zero, adopted stimulus packages to the economy and introduced quantitative easing (QE) mechanisms (Akhtaruzzaman et al., 2021). Movement restrictions, put in place to mitigate the spread of the pandemic, caused a financial downturn due to the resulting aggregate supply and demand reduction (Mosser, 2020).

The governments intervention meant that borrowing became cheaper with the introduction of zero interest inducing the credit expansion phase. The available credit and increased free time ultimately led to investment seeking options to invest. Social media was the connecting tool for the travel restricted populous and besides keeping contact with each other it led to sentiment transmission for investments opportunities (Youssef & Waked, 2022). Speculation in the cryptocurrencies market, aswell as buying pandemic-stricken companies' stocks on discount became rampant.

The Conference Board Leading Economic Index

The Conference Board's Leading Economic Index (LEI) for the United States is a composite index comprising of ten components.

It includes the average weekly hours worked in manufacturing, the average weekly initial claims for unemployment insurance, manufacturers' new orders for consumer goods and materials, ISM Index of New Orders, manufacturers' new orders for nondefense capital goods excluding aircraft orders, building permits for new private housing units, stock prices of 500 common stocks, leading Credit Index, Interest rate spread, 10-year Treasury bonds less federal funds and the Index of consumer expectations (The Conference Board, n.d.).

The LEI can thus deliver a precise and timely indication of the U.S. trajectory over a period of six to nine months (The Conference Board, n.d.). According to Lahiri and Yang (2015), the LEI has great conditional functionality for accessing the economic cycle and the effect on various industries. As a result, they itinerate that it can distinguish between recessionary and expansionary turning points and hence its forecasts enable a clearer picture of the labor market.

Unemployment rate

The labor market's wellbeing can be gauged by a look at the unemployment rate of a country. A flourishing market creates job opportunities reducing unemployment numbers, companies would need more employees in its production of goods and services. While a shrinking market does the opposite, as a decrease for goods and services means a company earns less and to save on fixed costs, employees are let go expanding the unemployment numbers.

The U.S. Bureau of Labor Statistics (BLS) tracks unemployment data and provides monthly data about the changes in the labor force. The data is aggregated by surveys on, eligible households to represent the civilian noninstitutional population as well as on establishments representing both nonfarm private institutional business and governmental employees. Additionally, to counter seasonal employment fluctuations, the BLS adjusts the data series to represent the labor force effectively (BLS, n.d.-b).

In light of manias and panics, Franklin et al. (2009) emphasized that unemployment rates rise 7% on average, in a period lasting 4 years after a crisis occurs. Furthermore, according to (Albanesi & Kim, 2021), during recessions, unemployment, dips take longer to recover to their pre crises levels. Albanesi and Kim (2021) attribute this to a decrease in labor demand from the employer's side.

Additionally, Claessens et al (2009) imply that during severe panics and the resulting recessions, the employment rate can reach three times the normal rate before the recessions occurrence.

Growth domestic product per capita growth rate

The Growth Domestic Product measures the total income, as well as the total expenditure of both goods and services in an economy (Mankiw & Taylor, 2014). To be able to effectively measure the wealth a person has relative to the whole country, the GDP per capita derived from dividing a countries GDP by its population number with be utilized in this paper. A 2017 study showed that high productivity in a healthy economy leads to higher labor productivity. They concluded that by increasing productivity in the labor market, the GDP per capita also rose accordingly in the U.S. aswell as in other developing countries (Schein & Haruvi, 2017).

This paper proposes to use the GDP per capita growth rate as a labor market welfare indicator, with the assumption that if the economy is faring well, as the case of mania scenarios, employees also profit from the market's profits and in panic episodes they are on the losing side as they too are directly affected by the economic downturn associated.

Katkov (2012) showed that during the 2008 financial crisis, the U.S. nominal GDP dropped by -5.4 % towards the end of 2008 and a further -6.4% during the first quarter of 2009. During euphoric stages households possess more savings and income and during panic phases this income dwindles and this also leads to the imminent GDP decline (Aliber & Kindleberger, 2005).

Wages growth rate

According to the theory of efficiency wages, higher wages above the equilibrium level can lead to an increase in productivity (Mankiw & Taylor, 2014). Thus, firms have the incentive to increase the employee's wages as the company's profits grow. This in turn leaders to higher production and a boom in the general economic climate.

Additionally, in times of manias there is more cash available for firms to expand their businesses and this creates employment opportunities.

The wages paid out to employees increase their chances for having investments funds available and these funds are also used to fuel manias. Upon economic downturns, the reduction of liquid capital also affects the wages paid out as firms seek to reduce their costs resulting in stagnant wages.

Methodological approach

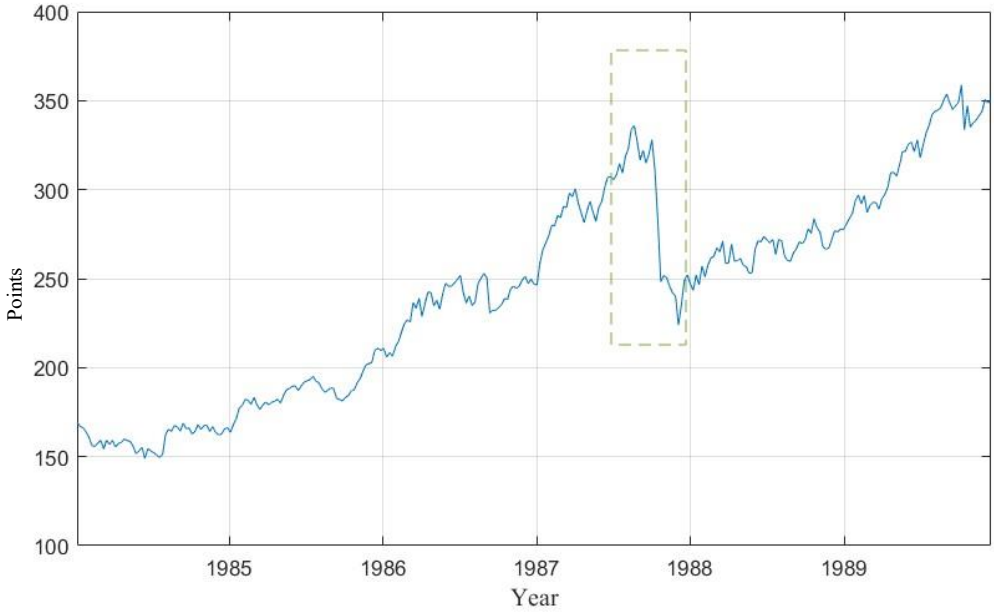
Primarily, this research investigates the development of four manias and panics periods in the U.S. stock market from 1983 until 2023. Time series from the S&P 500, the stock market's proxy, are used as the independent variable. Secondly, the dependent variable, defined in this case as the labor market is scrutinized. This is done with the help of four indicators, namely the conference board's leading economic index, the unemployment rate, the growth domestic product growth rate, and the wages growth rate. To ensure comparability, monthly and yearly datasets were aggregated from databanks such as the World Bank (World Bank, n.d.), the U.S. Bureau of Labor Statistics (BLS, n.d.-a) and the Federal Bank of Atlanta (Atlantafed, n.d.) and finally the Bloomberg finance terminal. Econometric and statistical analysis were carried out by use of SPSS and MATLAB software.

3. Findings

1987 Black Monday

During the crash of 19th October 1987, the S&P 500 saw its lowest points of the year at 216 points, a drop of 20.5% from its 282.7 points on the 16th of October, as illustrated in **Figure 2** below. During the asset bubble, the S&P 500 had peaked on the 20th of August 2017 at 334.84 points.

Figure 2: Black Monday S&P 500 crash



To better reflect the intensity of the black Monday crash, a returns table is also plotted. From **Figure 3** below, the drop is more visible relative to the other trading days. The mania peaks around August 1987 with returns close to +12%, before the plunge a month and a half after. The market eventually recovers but the returns are not in the same magnitude.

Figure 3: S&P 500 returns before and after black Monday

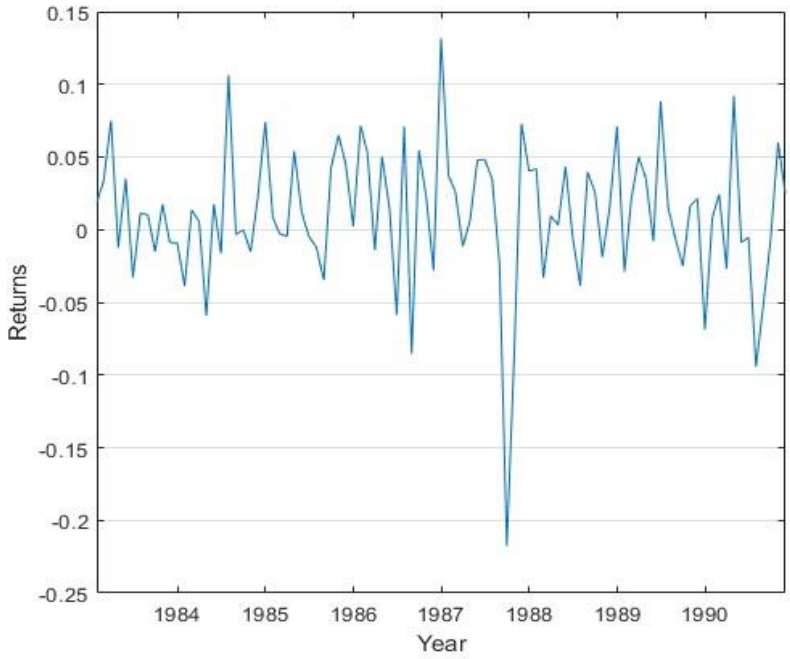


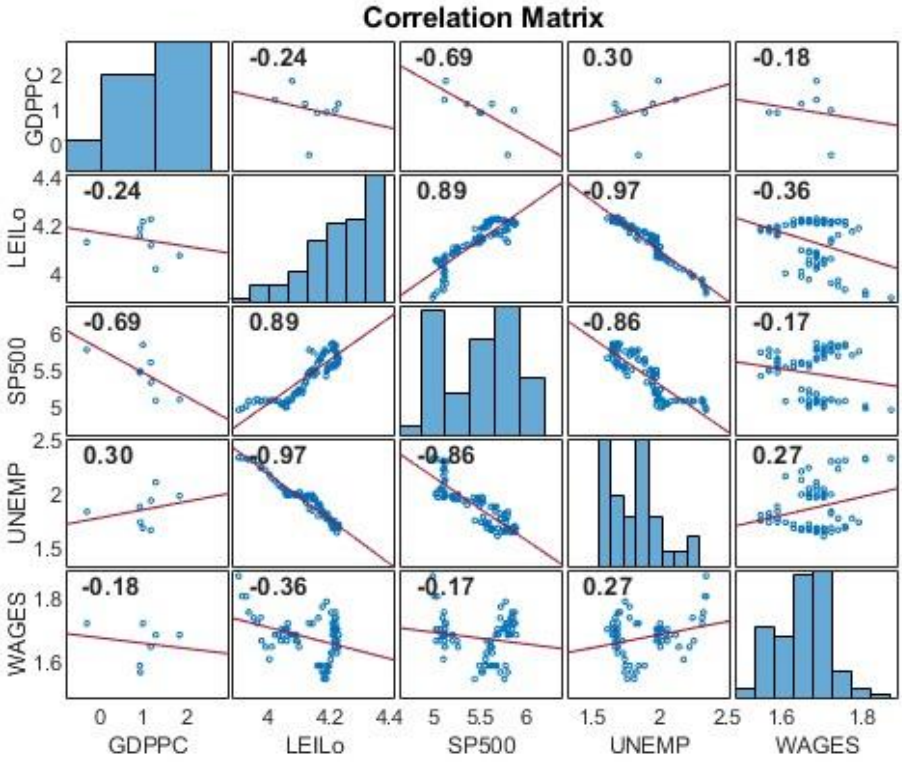
Table 1: Black Monday scenario descriptive statistics

	S&P 500	S&P 500 Returns	LEI	UNEMP	Wages Growth	GDP pc Growth
Mean	245.25	0.98%	62.55	6.73%	5.36%	3.12%
Minimum	145.30	-21.8%	49.4	5.0%	4.7%	0.74%
Maximum	361.23	13.2%	68.7	10.4%	6.5%	6.31%
Std. Deviation	67.48	4.8%	5.19	1.39%	0.35%	1.56%
Kurtosis	-1.36	4.75	-0.33	0.63	0.54	3.01
Skewness	0.07	-1.05	-0.76	1.03	0.30	0.95

Table 1 shows that the stock market fared on well during the seven years with the yield deviating 5% from the mean. The unemployment rate also experiences pumps and dumps with a peak of 10.4% and a low of 6.6%. Coincidentally, the GDP per capita growth rate is also reactive and has a top of 6.31% and a bottom of 0.74%. The wages growth rate does not have extreme up and down variations, as other labor market indicators and its kurtosis suggests normal distribution. The normal distribution implies that the growth rate ranges does not deviate too much from its mean.

The negative skewness of the S&P 500 at -1.05 indicates continuous growth during the seven-year period and it occurs at a faster pace than the other variables. The returns kurtosis indicates an earlier rapid boom, that fades quickly over time in line with an asset bubble development that is followed by its burst and then a gradual slow normalization. Due to the varying numeral size differences of the time series, a log function is done for the five indicator variables minus the return's variable. The correlations of the log values are then calculated and are illustrated in a correlation matrix in **Figure 4**.

Figure 4: Black Monday correlation matrix for the S&P 500



Additionally, from the correlation analysis, it is evident that the S&P 500 is inversely correlated to three labor market indicators. The unemployment rate has the highest negative correlation (-0.86), followed by the GDP per capita growth rate (-0.69) and the wages growth rate comes in last (-0.17) as shown in. This implies that a rise in the S&P 500 lead to lower unemployment rates, higher GDP per capita growth and a slightly higher wages growth. The LEI indicator has the highest positive correlation to the S&P 500 with a correlation value of 0.89 indicating it rises as the S&P 500 rises.

Table 2: Black Monday S&P 500 correlation summary

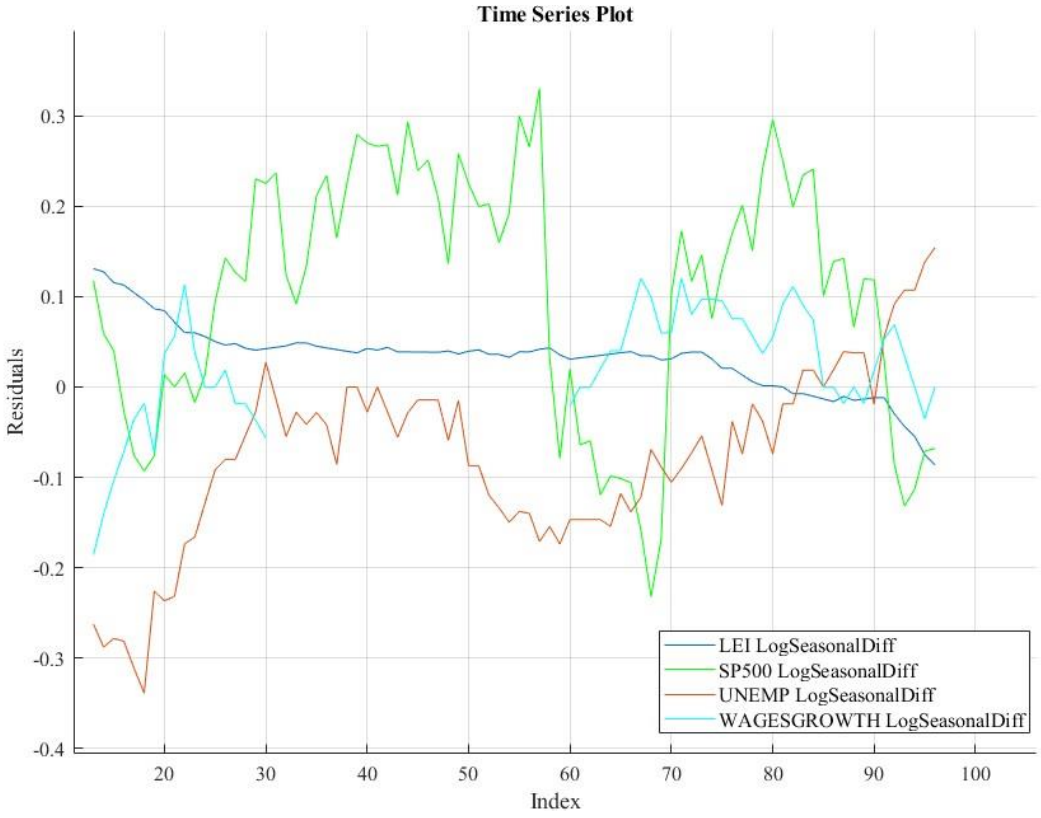
		S&P 500	LEI	UNEMP	Wages growth	GDP pc growth rate
S&P 500	Pearson Correlation	1	0.89**	-0.86**	-0.17	-0.69*
	Significance. (2-tailed 0.05)		<0.001	<0.001	0.32	0.48
	P-value after 2 lags	Johansen cointegration test 0.012 at 0.05 significance level				

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

To determine the pace with which the labor market follows the stock market, the logarithmic values are corrected for seasonality to remove predictability in the data and then non-stationary values are decoupled from the collected data. The non-stationary data removal is to ensure only datasets with constant means and standard deviations are left and ensures the absence of white noise as illustrated in **Figure 5**.

Figure 5: Residuals plot after removal of non-stationary and seasonal data

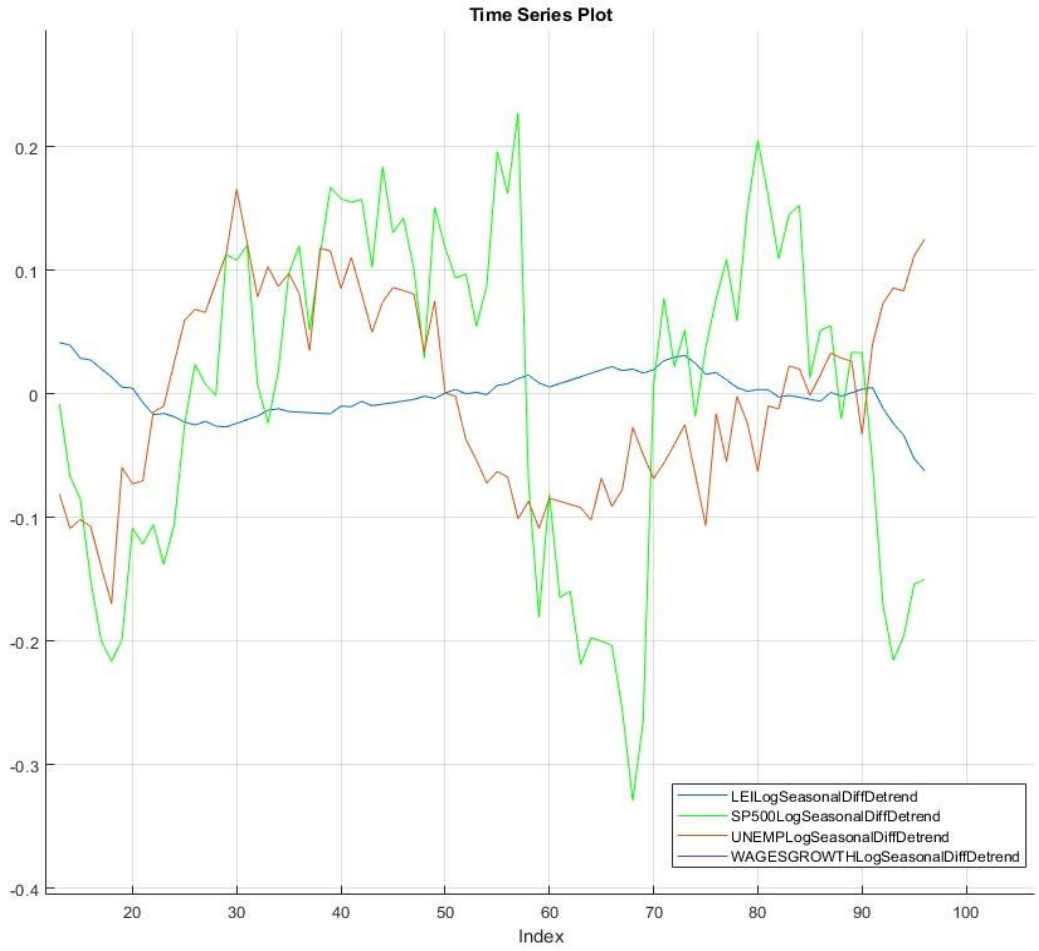


From the plot above, it is possible to deduce that the S&P 500 leads most labor indicators. Notably, the unemployment rate differs from the S&P 500 in the beginning years index, but it gradually catches up and the inverse relationship continues. GDP per capita growth rate remained seasonal and had numerous varying standard deviations, mainly due to its observations being too low (8) and was not included in the plot.

Lastly taking linear trends and false correlations into account, detrending is performed to further confirm that the data at hand is refined to present a clearer illustration. Detrending is also performed to further reveal sub trends and cointegration is evaluated by means of a Johansen cointegration test. The null hypothesis states that co-integration is not present, while the alternative hypothesis articulates cointegration is present. Lag tests are performed and after 2 lag effects with a p-value of 0.012 and a 95% confidence level. Therefore, the null hypothesis can be rejected. Wages growth rate and the GDP per capita growth rate residuals are omitted as they have significant levels beyond the maximum 5% allowed as shown in **Table 2**.

Figure 6 depicts the resulting plot and it postulates that the S&P 500 precedes the labor market indicators after 2 lags during the black Monday mania and panic.

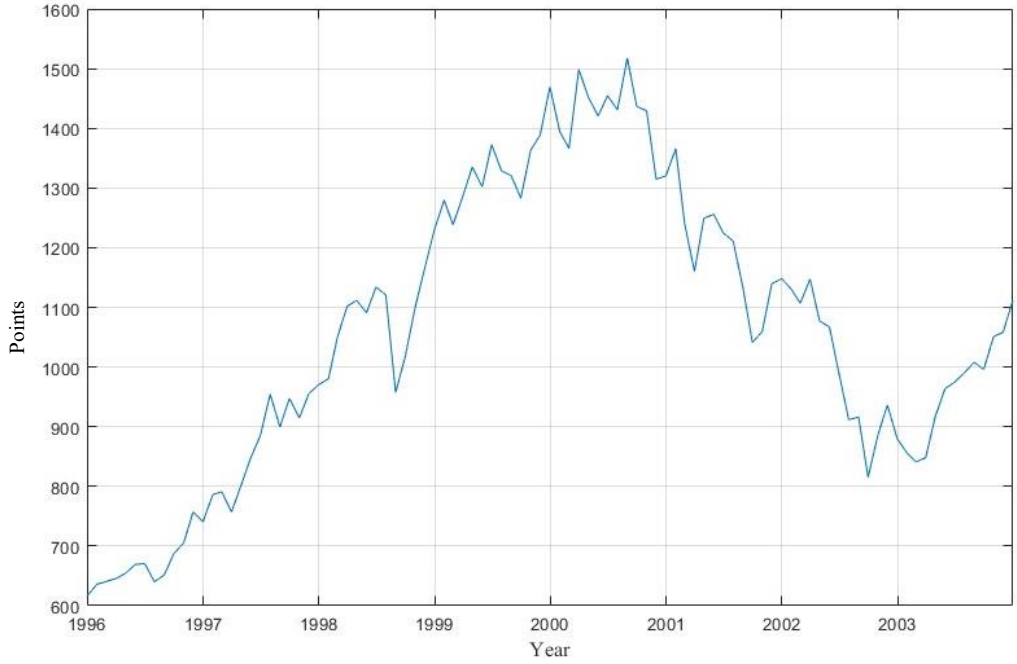
Figure 6: Residuals plot after removal of non-stationary, linear, and seasonal datasets.



The 2000's Dotcom Bubble

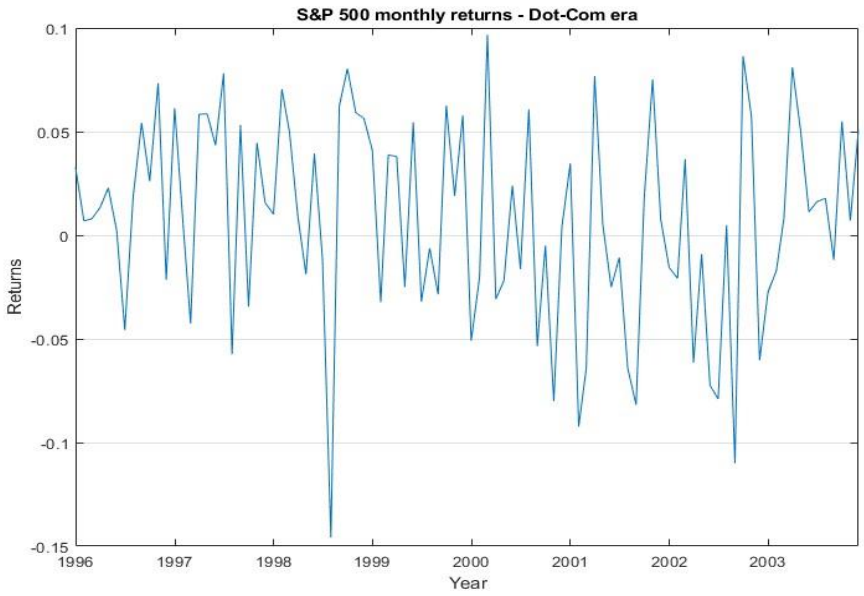
The Dotcom mania started in the mid 1990's and the stock market experienced a steady rise in value from 616 points in December 1995 and peaks in August 2000 reaching 1517 points as illustrated in **Figure 7**. The panic scenario set in around September 2000 and the decline persisted for the next three years.

Figure 7: The S&P 500 before and after the Dotcom bubble



The S&P 500 returns during the period oscillate over time, in contrast to the black Monday crash. There is a major dip in returns in the month of July 1998 to the tune of -15%. However, the stock market recovered rather quickly and continued the recovery until the peak of the bubble. Monthly returns fluctuated between +5% and -5% in the first three and a half years prior to the peak. After the catalyst for the crash in early 2001, the returns gradually increased to between -11% and +10% as illustrated in **Figure 8**.

Figure 8: S&P 500 Monthly returns during the Dotcom bubble



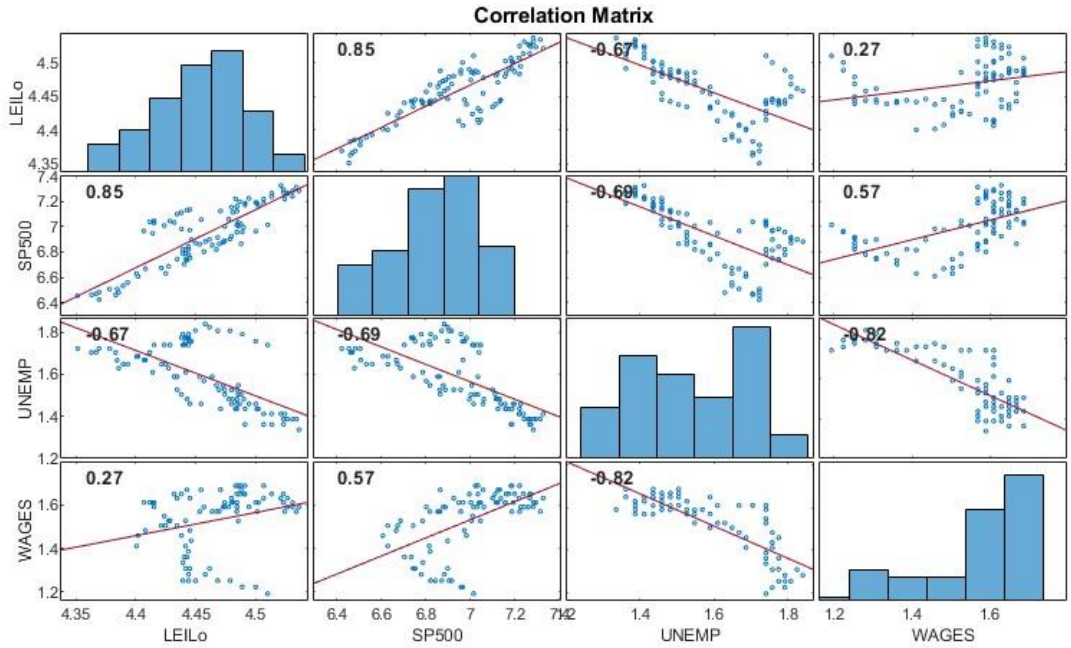
Descriptive analysis for the Dotcom period have been computed to show the numerical variations and are presented in **Table 3** below. 97 monthly datasets have been compounded for three variables and eighty-six for the wages growth rate. The GDP per capita growth rate only amounted to nine instances, as it has been calculated yearly. The maximum return recorded for the S&P 500 is 9.67% for March 2000 with a minimum of -14.58% for August 1998, which signaled the start of the bubble burst. The monthly S&P 500 returns mean dropped from an average of 0.98% in the black Monday era to 0.74%. The negative kurtosis values, indicate a platykurtic tendency with a flatter peak and thus suggests more data is strewn around the means of the variables. The LEI indicator showed the highest kurtosis, implying less of its data are around the mean. The skew values indicate that most of the data is distributed to the right tail meaning towards the end of the mania.

Table 3: Dotcom scenario descriptive statistics

	S&P 500	S&P 500 Returns	LEI	UNEMP	Wages Growth	GDP pc Growth
Mean	1061.75	0.74%	86.35	4.95%	4.66%	2.19%
Minimum	615.93	-14.58%	77.6	3.8%	3.3%	-0.04%
Maximum	1517.68	9.67%	93.3	6.3%	5.4%	3.6%
Std. Deviation	244.17	4.93%	3.84	0.72%	0.60%	1.25%
Kurtosis	-0.93	-0.04	-0.61	-1.40	-0.43	-0.64
Skewness	-0.04	-0.52	-0.22	-0.13	-0.90	-0.72
Observations	97	96	97	97	86	9

The Dotcom scenario had higher deviations from the mean in the data distribution of the S&P 500 insinuating higher price volatilities. To visualize the variables relationships, the logarithmic values of the variables have been calculated. Thereby, correlation comparisons were enabled, and the results have been plotted in **Figure 9**.

Figure 9: Dotcom epoch correlation matrix



As the S&P 500 prices rose, so too did the wages growth rate with a correlation coefficient of 0.57 that was only topped by the LEI variable. The unemployment rate of the era was slightly lower as indicated by the correlation increase from -0.86 to -0.69. The correlation coefficient for the GDP per capita growth was deemed less significant after a 95% confidence interval test is performed. The probability of error was too high at 29% to pass the 5% safety level, as shown in **Table 4**, and has been ignored concerning further calculations.

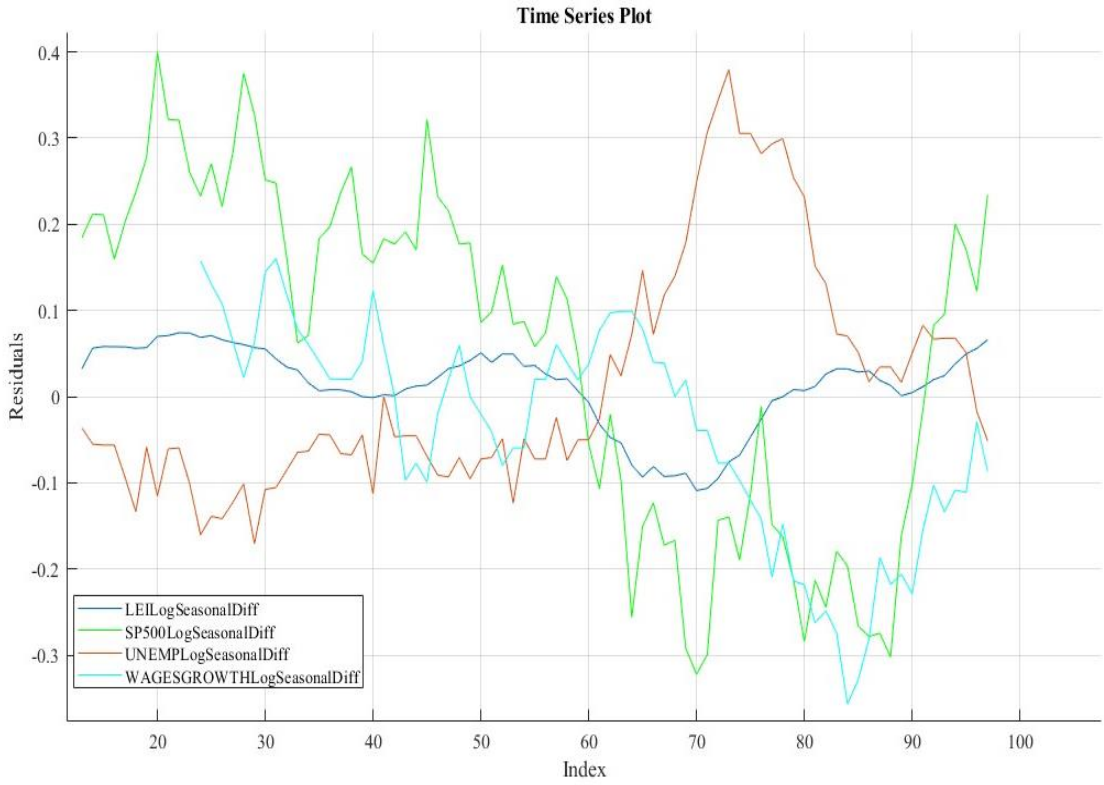
Table 4: Dotcom era S&P 500 correlation summary

		S&P 500	LEI	UNEMP	Wages Growth	GDP pc Growth
S&P 500	Pearson Correlation	1	0.85**	-0.69**	0.57**	0.40
	Significance. (2-tailed – 0.05)		<0.001	<0.001	<0.001	0.29
	P-value after 5 lags	Johansen cointegration test 0.001 at 0.05 significance level				

** Correlation is significant at the 0.01 level (2-tailed).

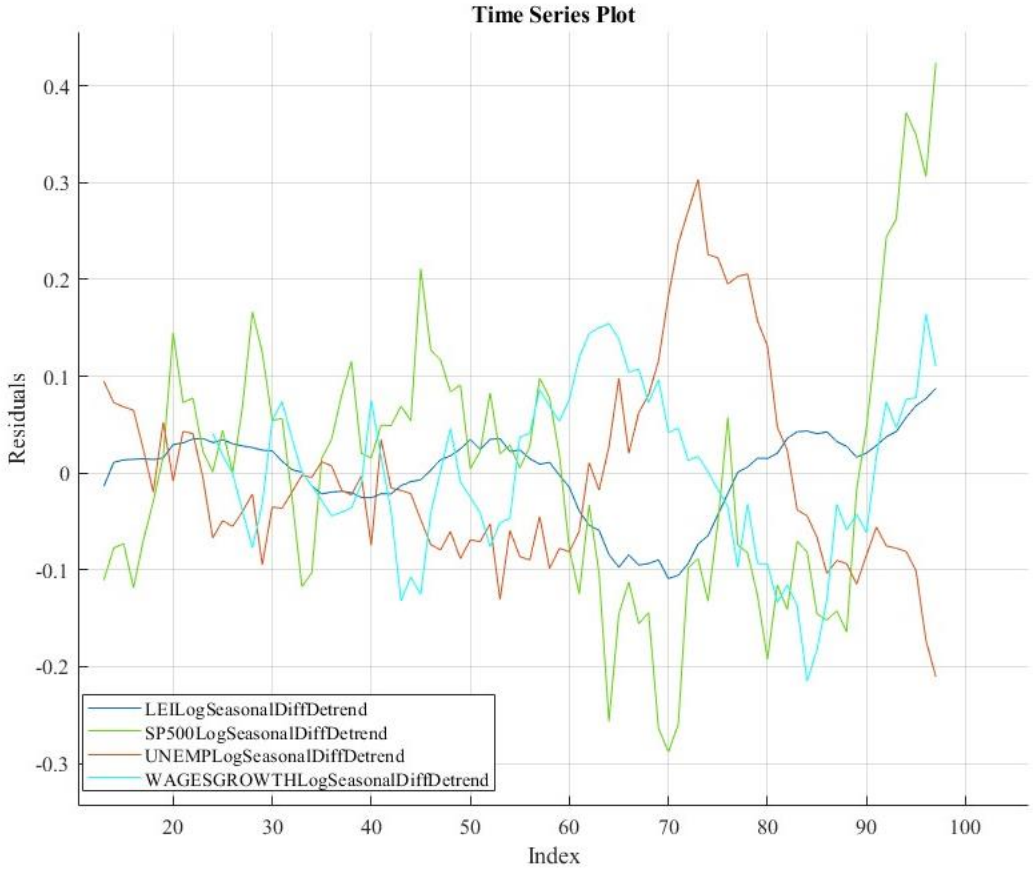
The logged variables have been differentiated to remove present seasonality in the time series data. By doing so, both the information and relationships between the variables have been improved, as illustrated in **Figure 10**.

Figure 10: Residuals plot after the removal of non-stationary and seasonal data



To check for cointegration, a Johansen cointegration test has also been conducted. The null hypothesis states that no cointegration is present while the alternative indicates the presence of co-integration. After 5 lags have been run, the null hypothesis is being rejected with a p-value of 0.001 at a 95% level, as shown in **Table 4**. The residuals were then detrended to enhance subtrends, as demonstrated in **Figure 11**.

Figure 11: Residuals plot after removal of non-stationary, linear, and seasonal data

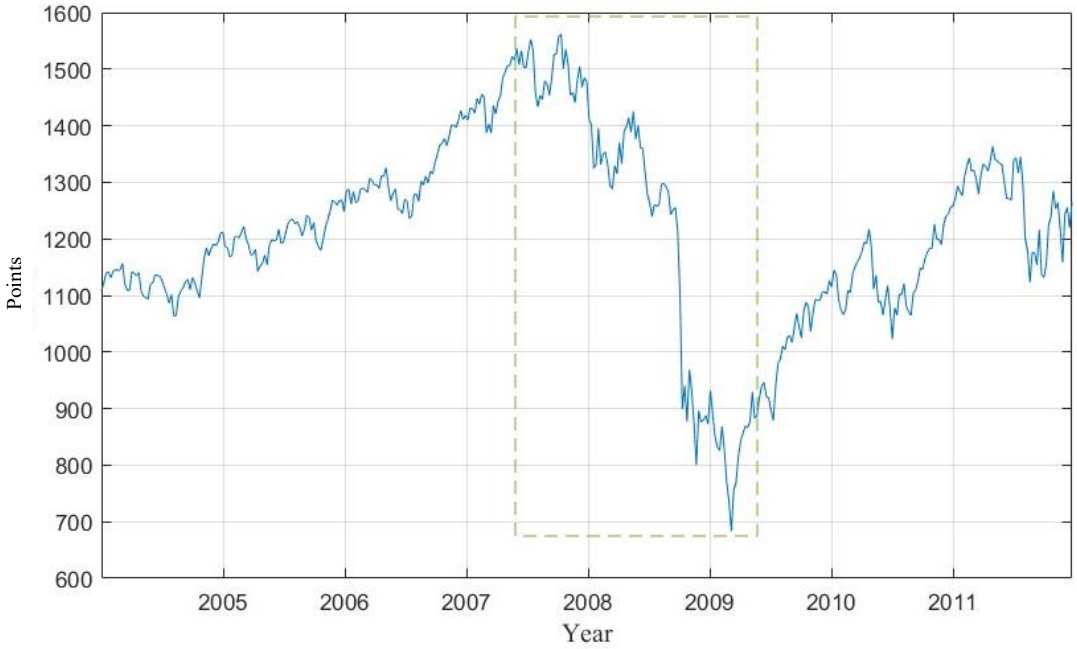


From the plot above the peaks in the S&P 500 are followed by lagging decreases in the unemployment rate. This is the case in year index 19, 30, 45 and 70. The same occurs for the LEI at index 20, 36, 43 and 53 though at a slower pace. 5 lags were used for the trending process.

The 2008 financial crisis

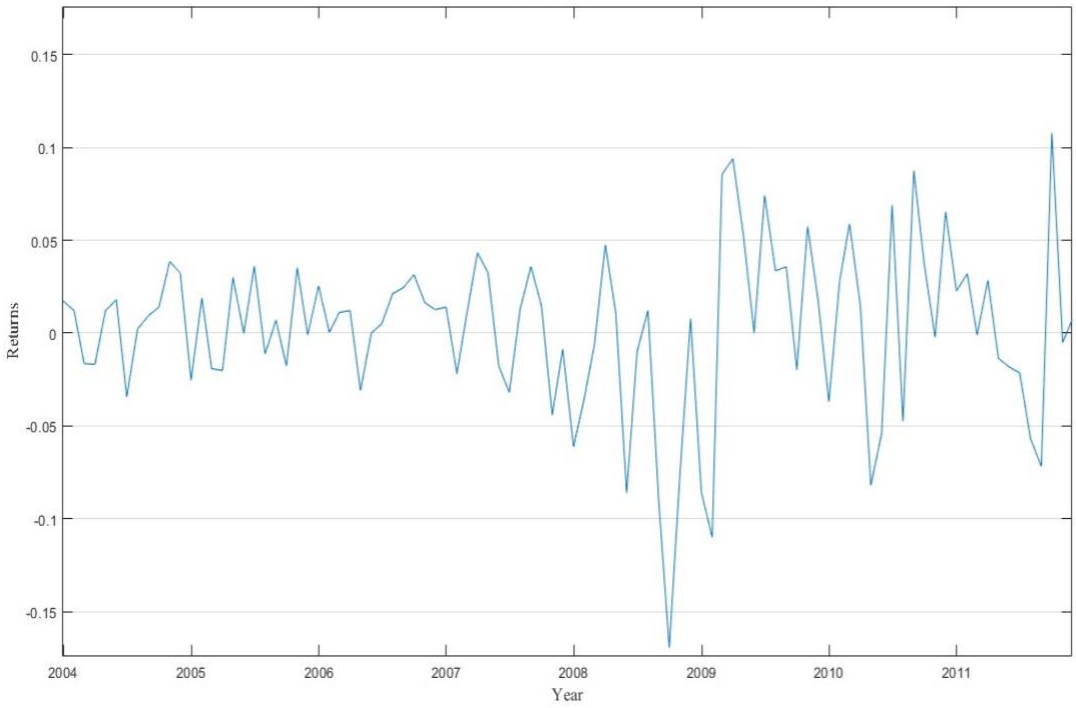
The stock market experienced continuous growth after the Dotcom bubble crash until the financial crisis happened around mid-2007. The S&P 500 peaked in October 2007 at 1549 points before the Lehmann Brothers debacle spark has been ignited to crash the market to its lowest level of 735 points in February 2009 - its lowest in nearly a decade erasing over 50% of its gains in 15 months, as shown in **Figure 12**.

Figure 12: The S&P 500 before and after the 2008 financial crisis



Monthly returns were in the range of +5% to -5% before the -17% drop in September 2008. Volatility persisted after the September 2008 drop and with-it higher returns not seen in the last five years before the crisis resurfaced, as shown in **Figure 13**. The unemployment rate surged to reach its high of 10% in October 2009, accompanied by a drop for the wages growth rate, that was still present three years after the start of the crisis. Returns from the stock market quickly peaked and shrank in the same manner relative to the periods before, as illustrated by the high kurtosis results in **Table 5**.

Figure 13: S&P 500 returns pre and post the 2008 financial crisis



Wages grew less during the financial crisis, as shown by the low standard deviation from the mean, as well as the lower minima of 1.6% and an even lower maxima of 4.4%, which has been close to the Dotcom era minimum of 3.4%.

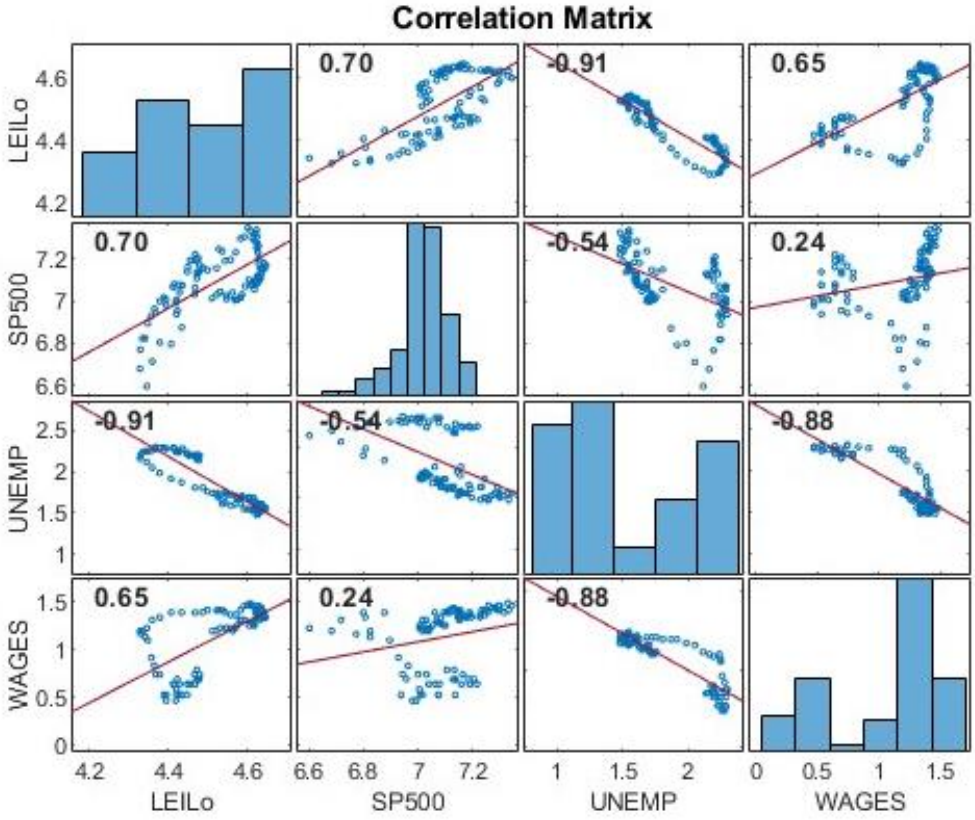
Table 5: 2008 financial crisis descriptive statistics

	S&P 500	S&P 500 returns	LEI	UNEMP	Wages Growth	GDP pc Growth
Mean	1213.11	0.23%	92.27	6.67%	3.24%	1.45%
Minimum	735.09	-16.94%	75.7	4.4%	1.6%	-0.82%
Maximum	1549.38	10.77%	104.0	10.0%	4.4%	2.90%
Std. Deviation	169.55	4.48%	9.06	2.09%	0.91%	1.1%
Kurtosis	0.16	1.92	-1.355	-1.59	-1.19	1.42
Skewness	-0.37	-0.74	-0.30	0.46	-0.66	-0.93
Observations	97	96	97	97	97	9

Correlation of the LEI and the wages growth rate to the unemployment rate nearly attained perfect inversion at -0.91 and -0.81 respectively.

The S&P 500's correlation with the unemployment rate increased slightly when being compared to that during the Dotcom bubble, as shown in **Figure 14**.

Figure 14: 2008 financial crisis correlation matrix



At a two tailed significance test of 5%, the GDP per capita growth rate attained 21% and has been deemed insignificant for the general model comparison, as shown in **Table 6**.

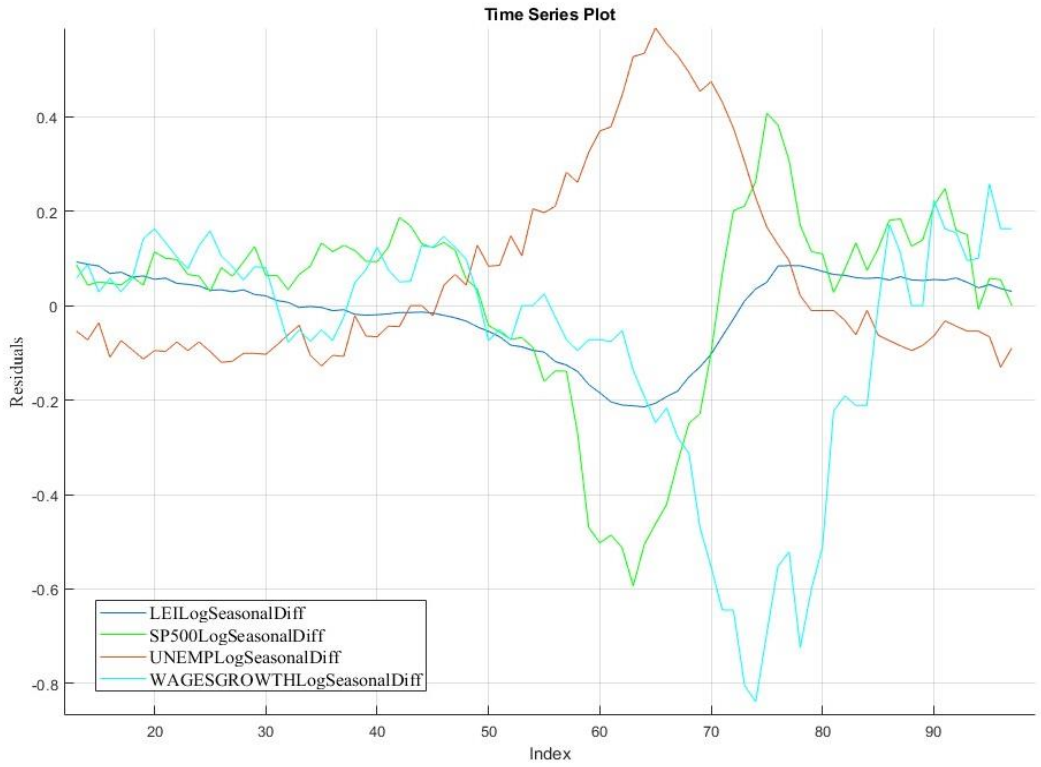
Table 6: 2008 Financial crisis S&P 500 correlation summary

		S&P 500	LEI	UNEMP	Wages Growth	GDP pc Growth
S&P 500	Pearson Correlation	1	0.70**	-0.54**	0.24**	0.47
	Significance. (2-tailed – 0.05)		<0.001	<0.001	0.001	0.21
	P-value after 2 lags	Johansen cointegration test 0.0016 at 0.05 significance level				

** Correlation is significant at the 0.01 level (2-tailed).

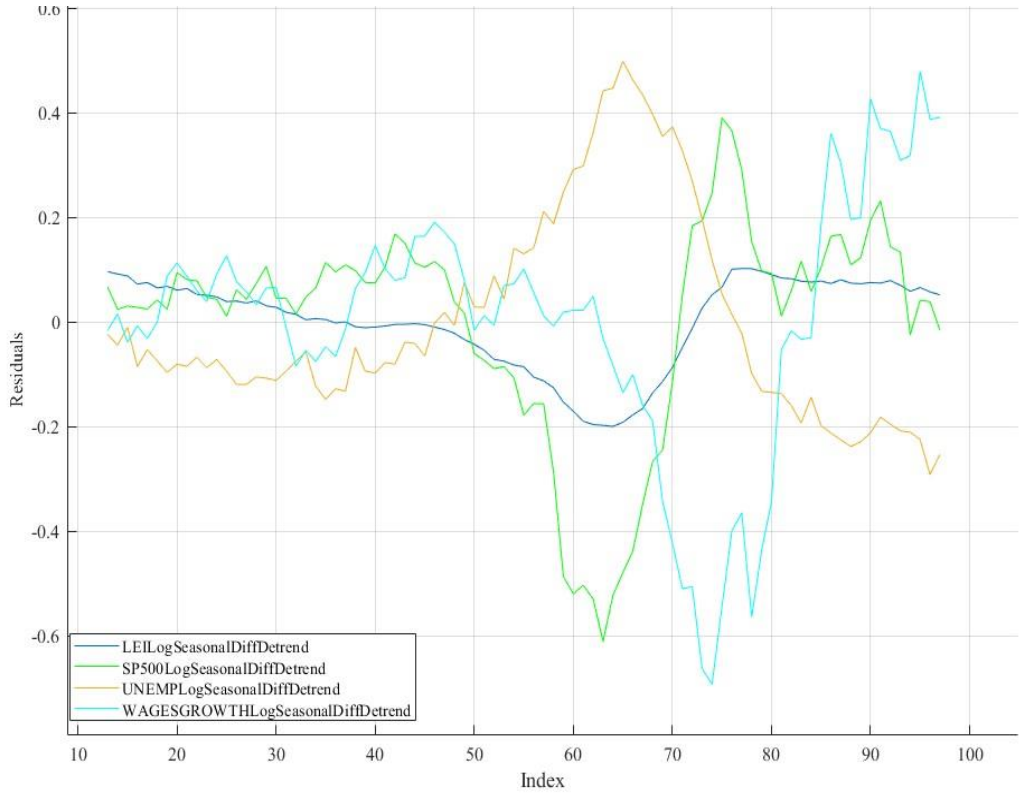
To ensure uniformity between the time series they have been logarithmically reduced to make easier comparisons and later been differentiated to remove seasonality, resulting in **Figure 15**.

Figure 15: Residuals plot after removal of non-stationary and seasonal data



To determine co-integration, a Johansen co-integration test has been performed. The null hypothesis has been rejected after two lags are carried out resulting in a p-value of 0.0016. The p-value gives the variables significance in the econometrics model. The inverse relationship of the unemployment rate to the S&P 500 can be seen with the two lags in place. That means the unemployment moves inversely to the S&P 500 after 2 - index lags. The wages growth rate follows the S&P 500 movements positively with the same lag, as shown in **Figure 16**.

Figure 16: Residuals plot after removal of non-stationary, linear, and seasonal data

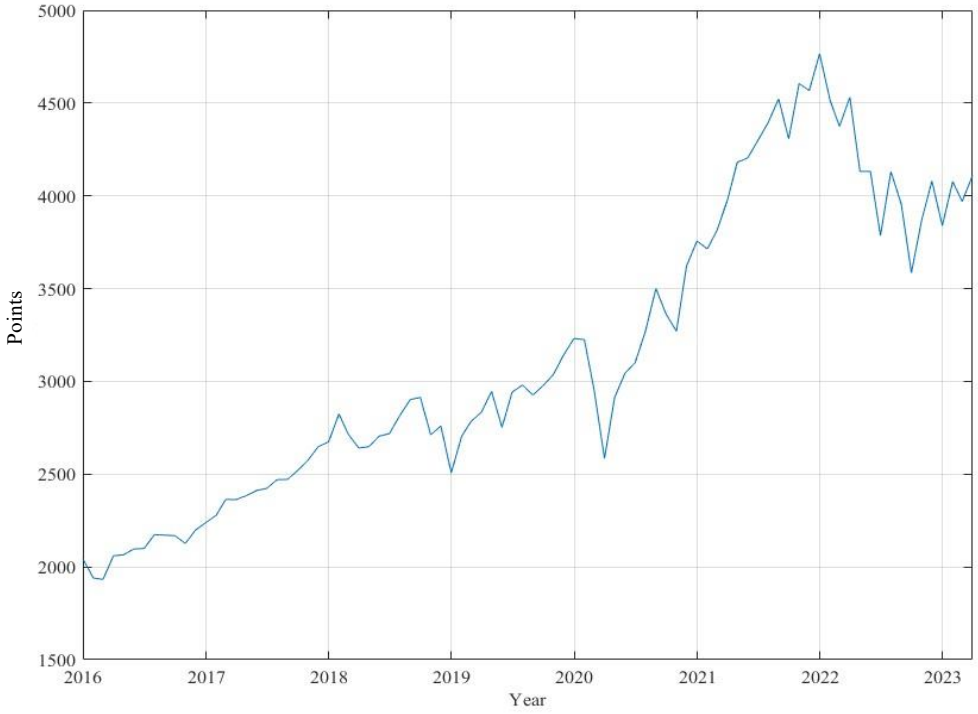


The 2019 Covid pandemic

The worldwide Covid pandemic led to an increased volatility in both the stock and labor markets. Prior to the lockdowns, the S&P 500 experienced an upward trajectory from 2016 that took an abrupt turn downwards in the beginning of 2020. The two months of February and March 2020 had negative returns of -8.4% and -12.5% respectively.

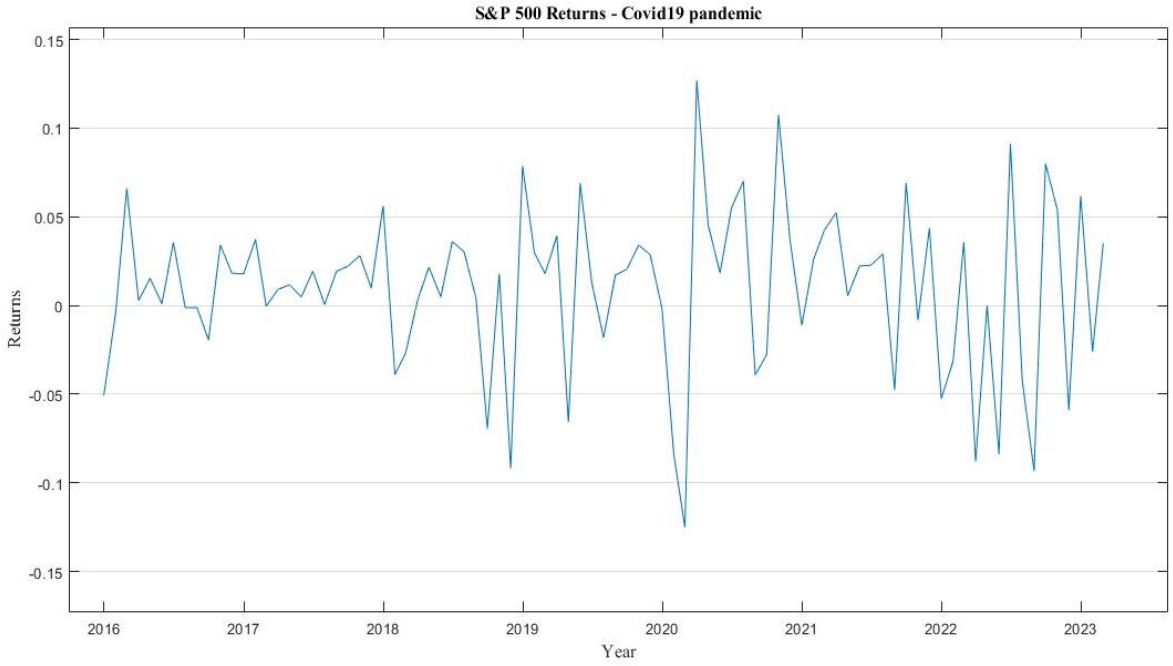
The negative returns were short lived, as the market revived rather quickly and in April 2020 the S&P 500 registered a 12.7% monthly gain that had been gaining momentum, as shown in **Figure 17** below. The labor market lagged a bit and at the lowest point of the S&P 500 in February 2020 the unemployment rate amounted to 3.5%. The unemployment rate peaked months later in April 2020 to reach with 14.7% its highest point in the last 30 years.

Figure 17: The S&P 500 during the 2019 Covid Pandemic



The stock market returns had previously dropped prior to the pandemic and October 2018 saw the first largest negative returns at -6.9%, which grew larger in December 2018 with a -9.2% return. After back-to-back negative returns in February and March 2020, there were more monthly returns in the -10% area, compared to modest gains of +5% thereafter, as shown in **Figure 18**.

Figure 18: S&P 500 returns before and after the 2019 Covid pandemic



To show the numerical variations, descriptive analysis for the 2019 Covid pandemic were also computed and summarized in **Table 7** below. Eighty-eight monthly datasets were examined for four variables. The GDP per capita growth rate only had seven instances, as it was calculated annually during the seven-year period. The maximum S&P 500 return recorded amounted to 12.68% for April 2020, with the minimum being -12.51% for March 2020 - the quickest returns recovery thus far. The S&P 500 monthly returns mean rose from the 2008 financial crisis average of +0.98% to 4.67%, implying steady growths over the timespan.

The unemployment rate had an excess kurtosis value of 11.26, indicating a very high and sharp peak and more data were distributed beyond the mean. The standard deviation of the S&P 500 was high at 791.70, suggesting increased volatility during the period. The GDP per capita experienced its lowest growth with -3.70%, during the year 2020. Both the positive skewness for the unemployment rate and the wages growth rate indicate most of the data is distributed to the left tail. The skewness implies the pandemic vastly affected these variables, demonstrating they performed better before the pandemic.

Table 7: 2019 Covid pandemic descriptive statistics

	S&P 500	S&P 500 Returns	LEI	UNEMP	Wages Growth	GDP pc Growth
Mean	791.701	4.67%	5.41	1.96%	1.07%	2.80%
Minimum	1932.23	-12.51%	99.5	3.4%	2.9%	-3.70%
Maximum	4766.18	12.68%	117.8	14.7%	6.7%	5.82%
Std. Deviation	791.70	4.67%	5.41	1.96%	1.07%	2.80%
Kurtosis	-1.06	0.551	-1.01	11.26	1.109	2.86
Skewness	0.40	-0.47	-0.32	3.13	1.6	-0.7
Observations	88	87	88	88	88	7

Correlation has been performed between the variables logs to show their relationships with each other during the period, as shown in figure 19. Most notably, the correlation for the S&P 500 and the unemployment rate increased significantly from -0.54 to a mere -0.02. Thus, its rather bigger previous inverse correlation is close to a positive correlation. The GDP per capita growth rates have been deemed insignificant after a two tailed significance test and the correlation with the other variables has also been interpreted as insignificant for comparison, as shown in Table 8.

Figure 19: 2019 Covid pandemic correlation matrix

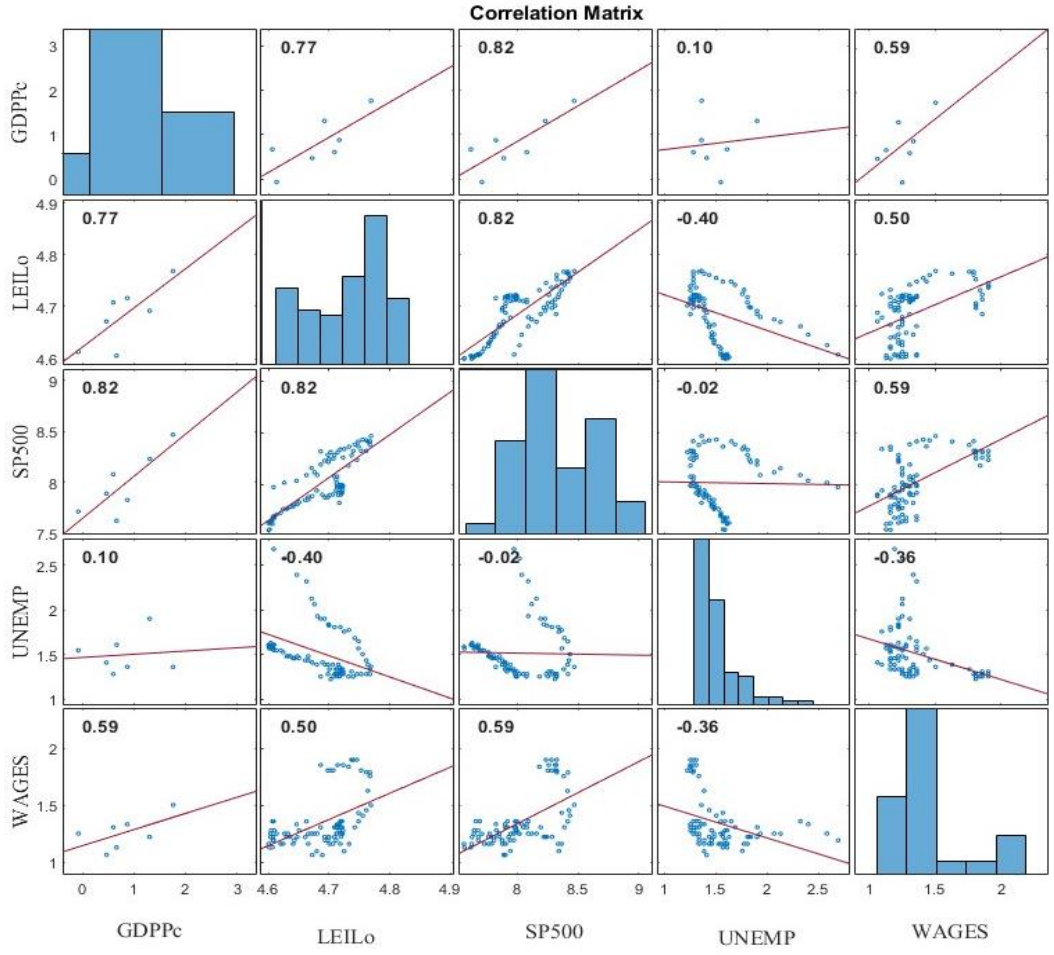


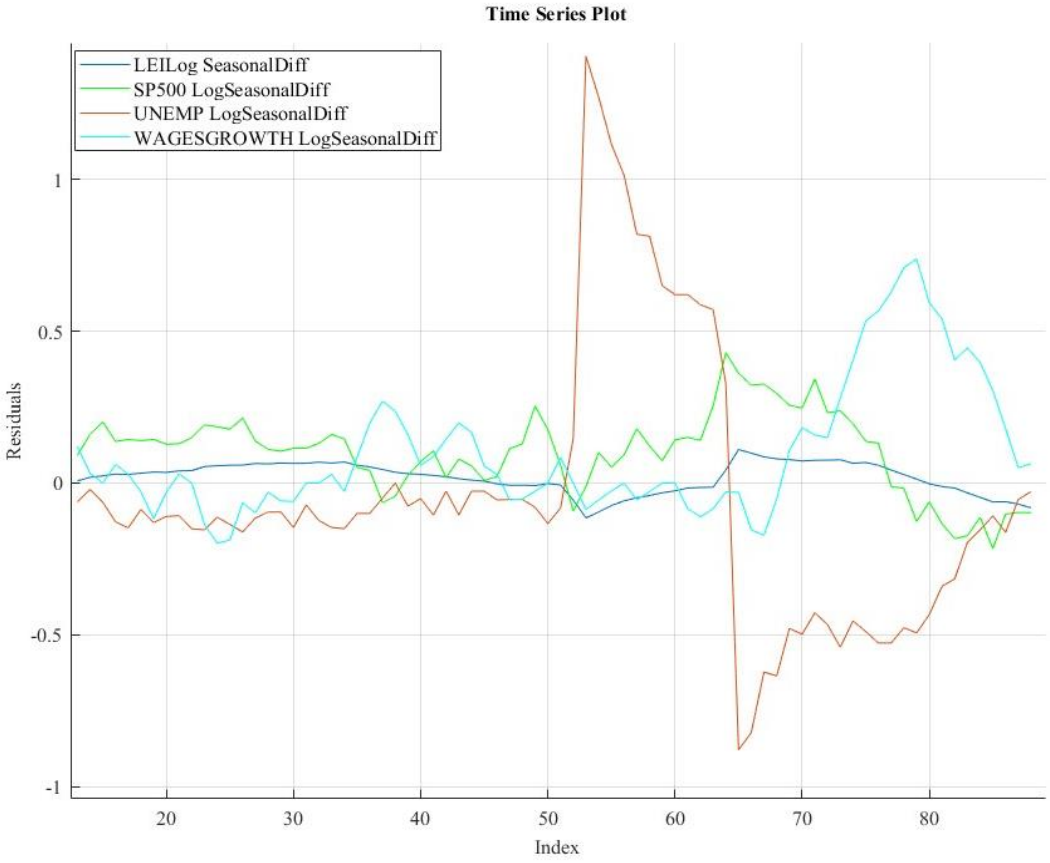
Table 8: 2019 Covid pandemic S&P 500 correlation summary

		S&P 500	LEI	UNEMP	Wages Growth	GDP pc Growth
S&P 500	Pearson Correlation	1	0.82**	-0.02	0.59**	0.20
	Significance. (2-tailed – 0.05)		<0.001	0.003	<0.001	0.66
	P-value after 2 lags	Johansen cointegration test 0.00 at 0.05 significance level				

** Correlation is significant at the 0.01 level (2-tailed).

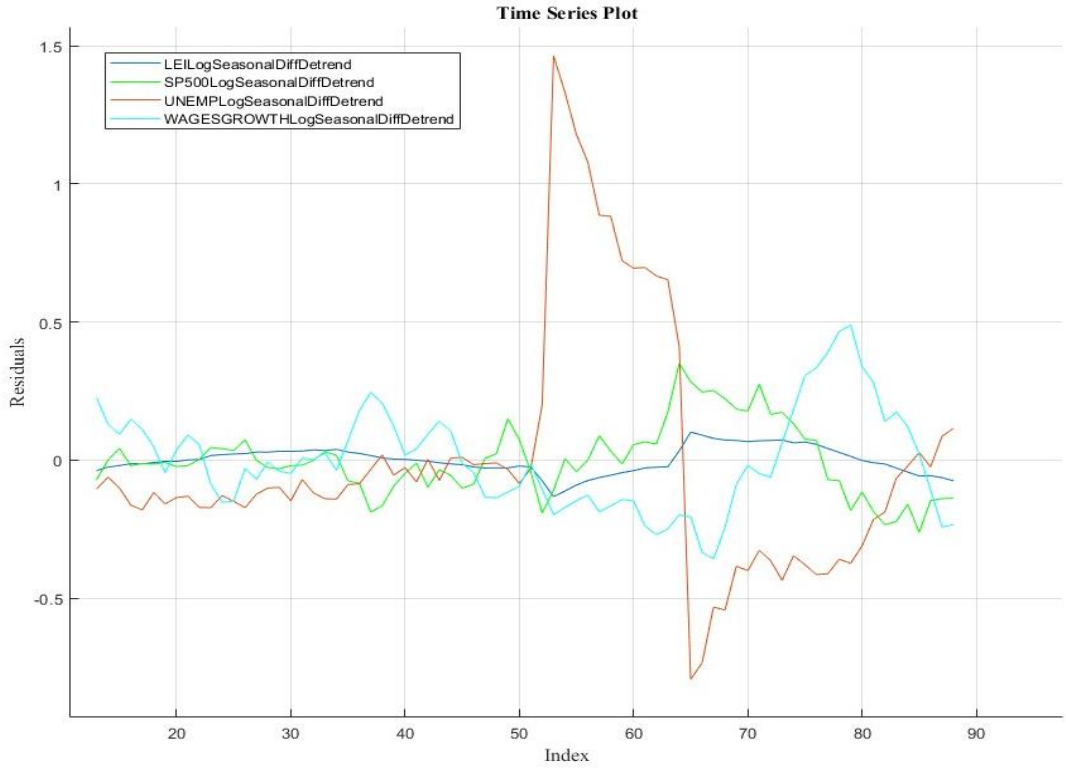
To ensure uniformity between the different sized time series, they were logarithmically reduced for comparison and differentiated to remove seasonality, as illustrated in **Figure 20**.

Figure 20: Residuals plot after removal of non-stationary and seasonal datasets



Finally, a Johansen cointegration test has been performed. The null hypothesis has not been rejected after 1 lag a p-value of 0.00 has been received. The 0.00 p-value at a 95% confidence level could not confirm the variables significance in the cointegration model. After the S&P 500 bottom in index 49, the unemployment rates peaked at time index 53 in **Figure 21**. The peak of the S&P 500 at time index 64 has been followed by the unemployment rate bottom at time index 65.

Figure 21: Residuals plot after removal of non-stationary, linear, and seasonal data



Forty years review

To conduct a general comparison with respect to the general market tendencies, an overall analysis has also been performed encompassing 40 years. These years overlayed all four manias and panics episodes and their respective recoveries. The stock market saw a general increase from the low of 145 points in January 1983 to eventually reach 4766 points in December 2021, as seen in 22 and summarized in **Table 9**. The black Monday drop of -21.76% remained the biggest drop in the stock market. The three following panics also contributed vastly to the lowest returns of the era in the -15% area. As depicted in Figure 23, on average, the returns from the S&P 500 deviated by around 4.5% from the mean. The skewness of the observed data has been mostly negative, implying progressive increases over time.

Figure 22: S&P 500 historical performances

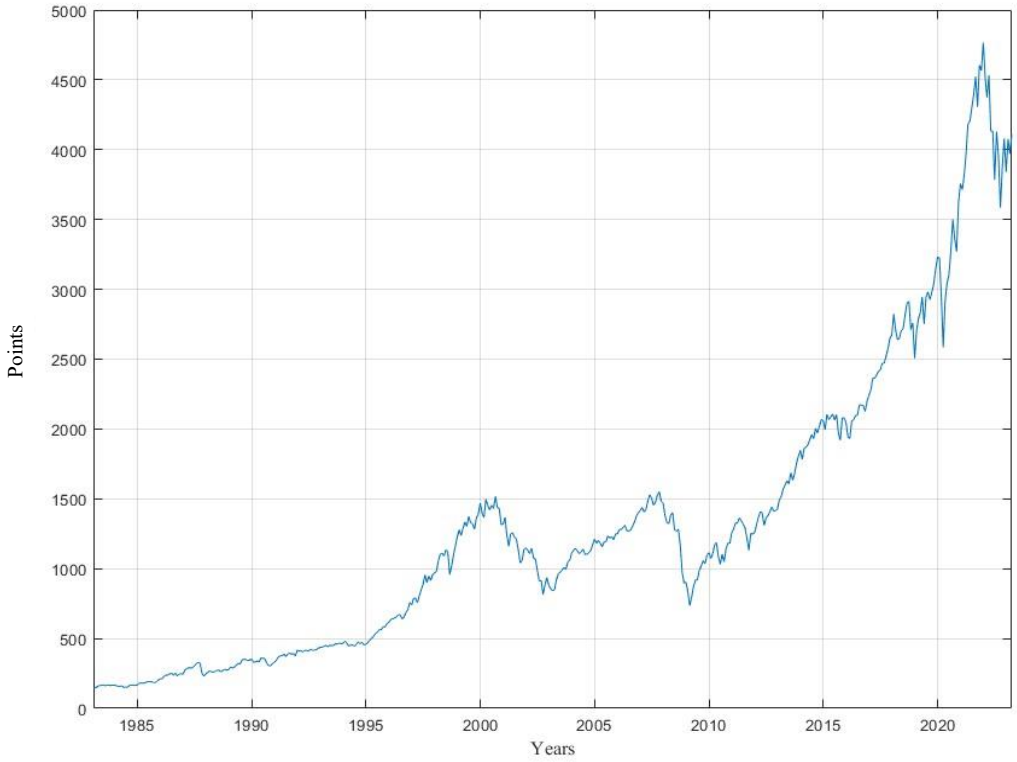
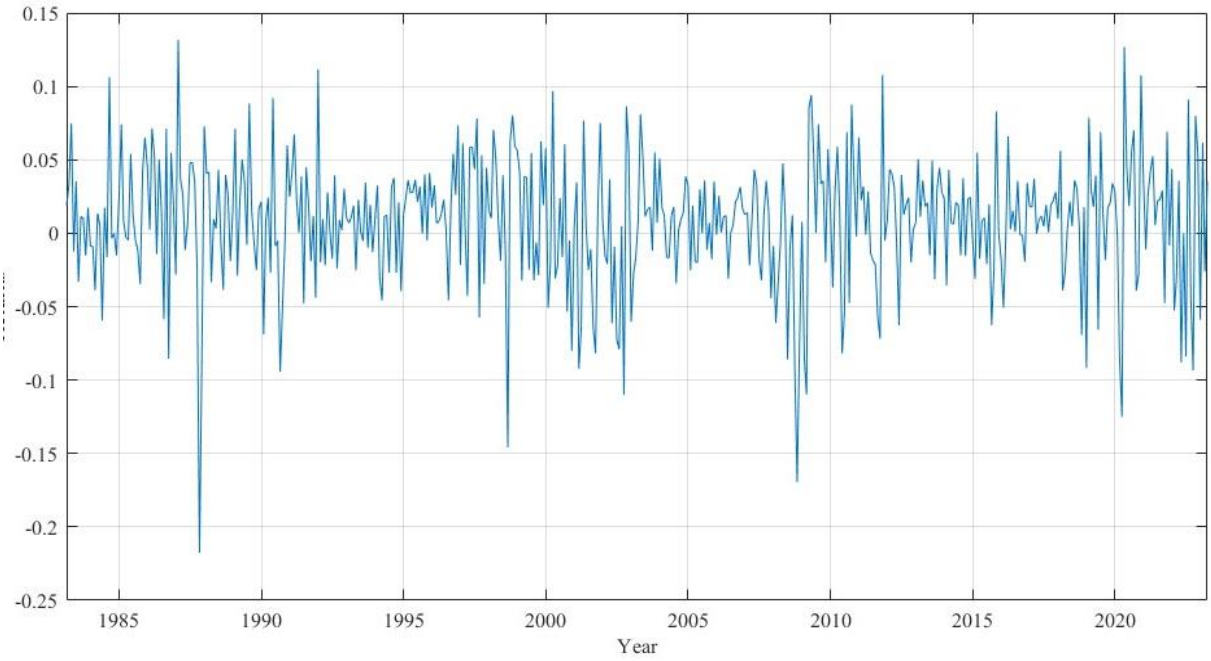


Figure 23: Historical outlook S&P 500 returns



The kurtosis levels have been largely positive over the years with gradual steady growths around the mean. The GDP per capita had the standout excess level at 3.02 indicating a distinctive peak and implying more values are in the tails of the distribution.

Table 9: 40 years outlook descriptive statistics

	SP 500	RETURNS	LEI	UNEMP	Wages Growth	GDP pc Growth
Mean	1300.25	0.79%	86	6%	4%	2%
Minimum	145.30	-21.76%	49	3.4%	2%	-4%
Maximum	4766.18	13.18%	118	14.7%	7%	6%
Std. Deviation	1047.97	4.38%	16.87	1.73%	1.15%	1.74%
Kurtosis	1.26	2.04	-0.96	1.39	-0.62	3.02
Skewness	1.29	-0.68	-0.09	1.02	-0.18	-0.48
Observations	483	482	483	483	449	39

Positive correlation of the S&P 500 and the labor market indicators has been highest with the LEI indicator at +0.97. The unemployment rate had the most inverse relationship with -0.46 followed by the wages growth rate at -0.40, as plotted in **Figure 24**. The GDP per capita growth rate was recorded at +0.20, but the significance levels in a two-sided confidence test yielded 0.66 and has proved less meaningful given the 0.01 threshold, as summarized in **Table 10**.

Figure 22: Correlation – Historical outlook

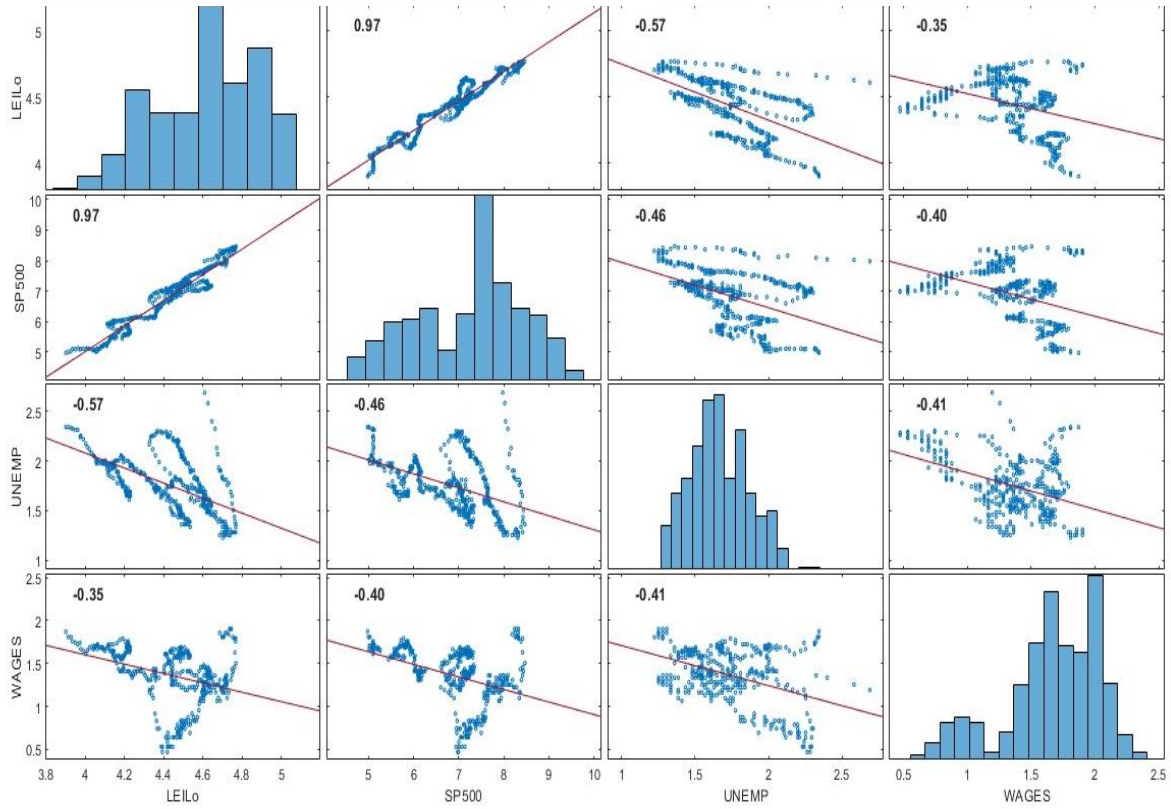


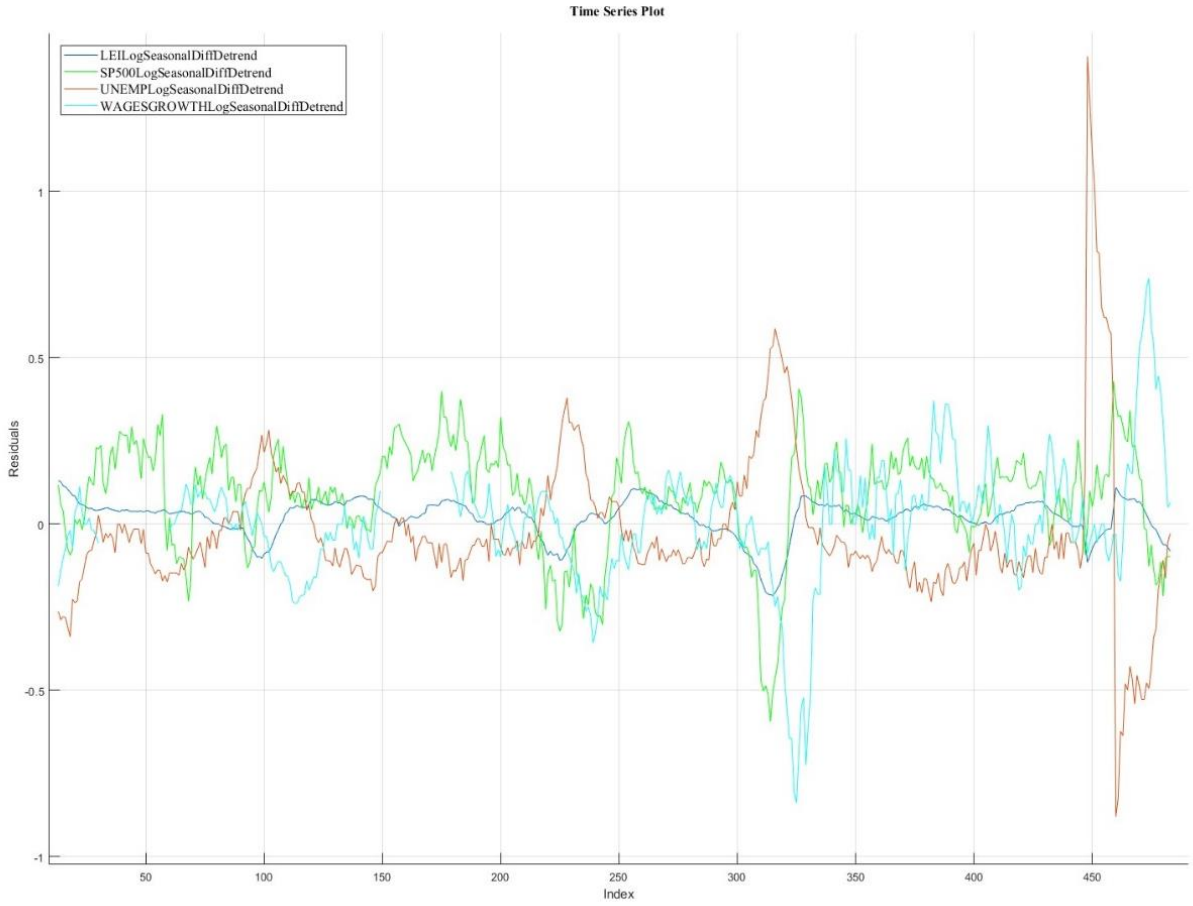
Table 10: S&P 500 historical correlation summary

		S&P 500	LEI	UNEMP	Wages Growth	GDP pc Growth
S&P 500	Pearson Correlation	1	0.97**	-0.46**	-0.40**	0.20
	Significance. (2-tailed – 0.05)		<0.001	<0.001	<0.001	0.66
	P-value after 2 lags	Johansen cointegration test 0.049 at 0.05 significance level				

** Correlation is significant at the 0.01 level (2-tailed).

A Johansen co-integration test yielded a p-value of 0.049 at a 0.05 significance level. Thus, the no co-integration null hypothesis has been rejected after 2 lags. After non-stationary, linear, and seasonal datasets were removed, the lagging three indicators are plotted in **Figure 25**.

Figure 23: Residuals plot after removal of non-stationary, linear, and seasonal data



4. Discussion

The contagion effect presented in manias regardless of their origins drove up asset and real estate prices fueling the markets returns, whereas the panics led to the opposite effect. Claessens et al (2009) defines this phenomenon as *twin peaks*.

The hypothesis that the labor market lags the stock market during manias and panics is contrasted to existing views towards the relationship. This is broken down according to the various manias and panic scenarios. It appears that the stock market constitutes the harbinger of the economic climate.

1987 Black Monday crash

In 1987, the October 19 crash saw the S&P 500 a negative return of -21.80% as its highest drop in the 1980's era. This article found that this one-day drop remained the largest for the following 40 years despite being nearly surpassed by the 2008 financial crisis at -16.94%.

Table 2 results highlight how labor indicators are correlated to the performance of the S&P 500. The unemployment rate's inverse relationship with the S&P 500 demonstrates this, with its turn from its maxima of 10% in 1983 and the recovery that followed during the mid-1980s assets mania. After the black Monday crash, the unemployment rate rose steadily from May 1990, when the rate amounted to 5.4% rising to 7.5% by June 1992. This lag goes in line with Albanesi and Kim (2021) observation of the labor markets' slow recovery after a crisis.

The LEI indicator had a strong positive correlation with the S&P 500, including a coefficient of 0.89 during the era. In line with Lahiri & Yang (2015), the indicator, - though with a slight lag, showed the occurrence of a recession during the period. The low p-values at 0.012 from the Johansen cointegration test, as well as the significance score below 0.001also supported the strength of the variable to explain the lag model.

Rejecting the no co-integration null hypothesis also demonstrated the significance of the lag model. Hence, the hypothesis that the labor market lags the stock market has been supported during the black Monday crash.

One limitation of the article is the use of the GDP per capita growth rate variable in the sample data for the black Monday crash. Calculated annually, it has not been convenient to run comparison analysis with monthly datasets of other indicators. However, as shown in appendix C, its peak of December 1984, during the mania phase, steadily dropped for the next six years and it reached its minimum in December 1990, three years after the black Monday crash.

The 2000's Dotcom Bubble

The technology driven Dotcom mania saw the S&P 500 soar to 1517 points in August 2000 and in view of Galbraith (1990) sentiments, unemployment rates fell from the black Monday highs to a low of 3.8% in April 2002.

Similarly, wages grew to new highs towards the end of 2000. The GDP per capita saw a growth of 3.6% during the Dotcom euphoric phase in December 1999 but two years later it fell to -0.04%.

Five lags have been performed, before the Johansen co-integration test null hypothesis has been rejected. This high number has been unexpected as the number of lags done for the previous mania and panic scenario are lower (at two).

The S&P 500 performance outweighed the labor indicators and despite the close correlation with a +0.8 coefficient the LEI showed modest fluctuations as illustrated in **Figure 10**, which can possibly be attributed to the strong gains from the stock market.

The 2008 financial crisis

Similar to previous research, the euphoric phase of the crisis saw numerous gains for the S&P 500. But after the critical stage has been reached, the economic downturn dominoed to the other sectors and had immense effects.

The eras unemployment rate with a -0.54-coefficient correlated negatively to the S&P 500, which jumped to 10% in October 2009. A year after the latter has bottomed with a -16.94% return in October 2008. The positively correlated LEI (+0.70 correlation coefficient) had a value of 84.1 at the S&P 500 bottom and it subsequently continued its downtrend in close association with the index.

The 2019 Covid pandemic

The 2019 Covid pandemic is the only crisis that had a disruption stage, which has not been directly attributed to macroeconomic actors. The stock market experienced a decline lasting months, that similarly occurred in the labor market.

Moreover, unemployment rates surged to a new high of 14.7% in nearly the same period in 2020 with just a month to separate them. The unemployment rate and the S&P 500 correlation results have been too close to draw straightforward conclusions.

Implications and limitations

This article dealing with the lag in the labor market can be helpful for policy makers when making contingencies for the economic downturns. Especially when manias are in place, political or monetary decision-makers should know euphoric episodes are followed by economic downturns. Hence, the necessary preparations to combat labor markets downturn could be put in place.

Additionally, the LEI indicator proved to foreshadow economic upheaves and down heaves. The indicator constitutes a practical tool in forecasting panic episodes, as well as acknowledging brewing manias.

Lastly, the GDP per capita growth rate can be a useful instrument to compute the populaces economic welfare. Monthly analysis can be utilized to examine the welfare of the public relative to the economic climate. This investigation illustrates that annual analysis can provide setbacks when trying to compute the wellbeing of the labor market.

Additionally, the wages growth rate data showed some gaps in the year 1986 and 1996. This missing data could lead to false interpretations and provided different interpretation results.

5. Conclusion

The findings of this investigation support the hypothesis that the labor markets response lags the stock market in the event of manias and panics. Previous studies have shown that manias and panics have contagion effects on other industries. However, the performance of the labor market is mostly scrutinized with the help of one indicator. The article proposes the use of more indicators. Besides the use of the unemployment rate, the growth domestic product per capita growth rate, the conference board's leading economic index and the wages growth rate are employed.

The 1987 Black Monday crash, the Dotcom bubble in the early 2000s, the 2008 financial crisis, and moderately the 2019 covid pandemic are the dissected incidences. In the four instances, the stock market fluctuated significantly, and the labor market responded similarly albeit some lag. The crash demonstrated an inverse relationship between the stock market’s performance and the unemployment rate. The labor market took time to react to the ensuing panic. The leading economic index on the other hand showed a strong correlation with the stock market, including a slight lag.

Similarly, during the Dotcom euphoria, the wages growth rate reacted with the smallest lag to follow the soaring stock market. The drop in the unemployment rate occurred rather late relative to the bubble mania. On the other hand, the growth domestic product per capita followed the euphoric stock market mania but took years to respond to the panic aftermath.

During the 2008 financial crisis, the unemployment rate took a whole year to react to the crisis downturn. In contrast, the leading economic index conjointly followed the stock markets trends but with a slight lag.

The 2019 covid pandemic introduced a unique scenario, where both the stock and labor markets experience nearly simultaneous disruptions. Government interventions mitigated the pandemic impact on both markets. As a result, the correlation between the markets has been rather inconclusive.

This study used monthly comparisons to analyze the labor market due to the monthly release of these indicators. For future research, indicators with weekly results could be analyzed to detect if the increased frequency would assist in collecting more minute information. This might have assisted in showing closely related relationships, such as during the 2019 covid pandemic.

The months when some labor indicators, such as the unemployment rate spiked or bottomed can be explained through seasonality. It would be interesting to see if the same can be explained for the occurrence of manias and panics in the economic cycle.

Overall, by emphasizing the connection between the stock market and the labor market during multiple boom and bust stages, this article aimed at adding insights to the body of research. It emphasized how crucial it is to take the labor market's lag into account when examining stock market swings. The findings can help contemplate economic crises contagion effects and might have an impact on policy decisions.

Conservation of gains made during euphoric stock markets can ease the turmoil the panics bring and thus lessen the burden of governments in the eventual labor market catch up. Reminding investors to be wary of the far-reaching consequences of their actions, might make them reconsider the undertaken risks.

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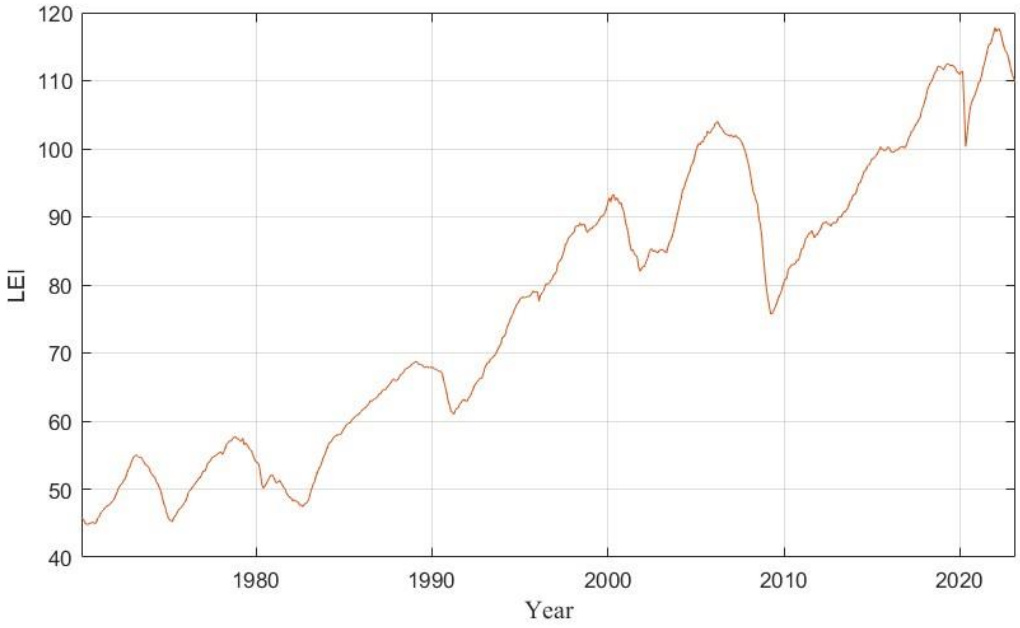
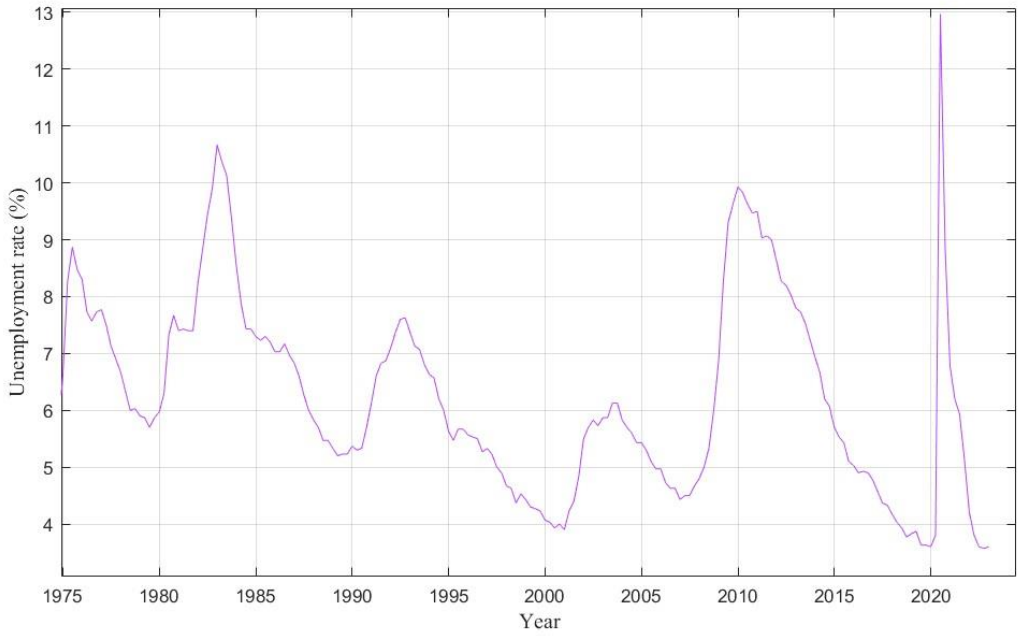
Appendix

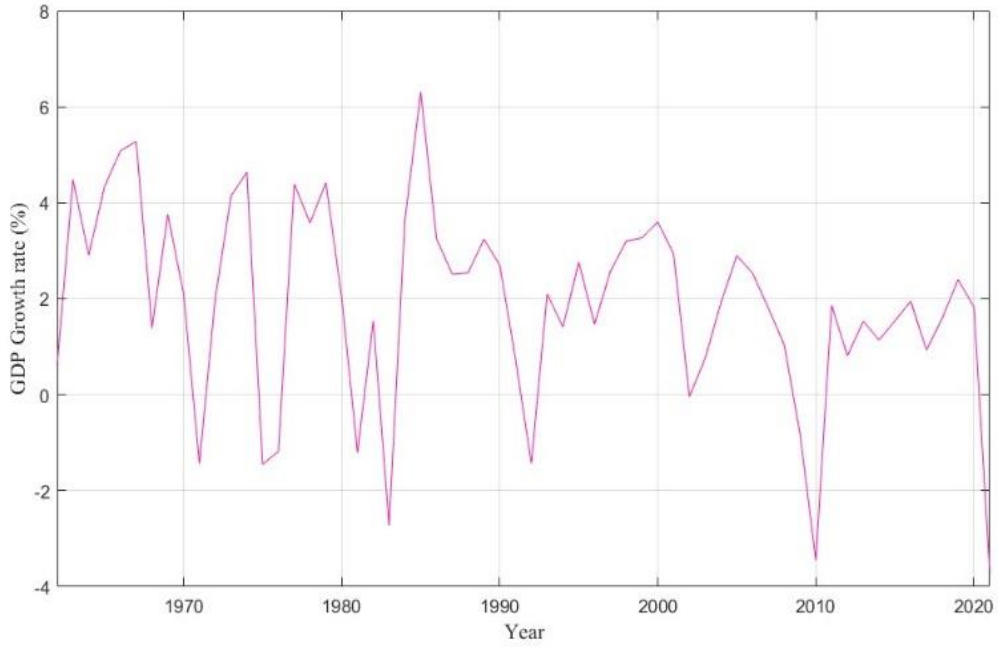
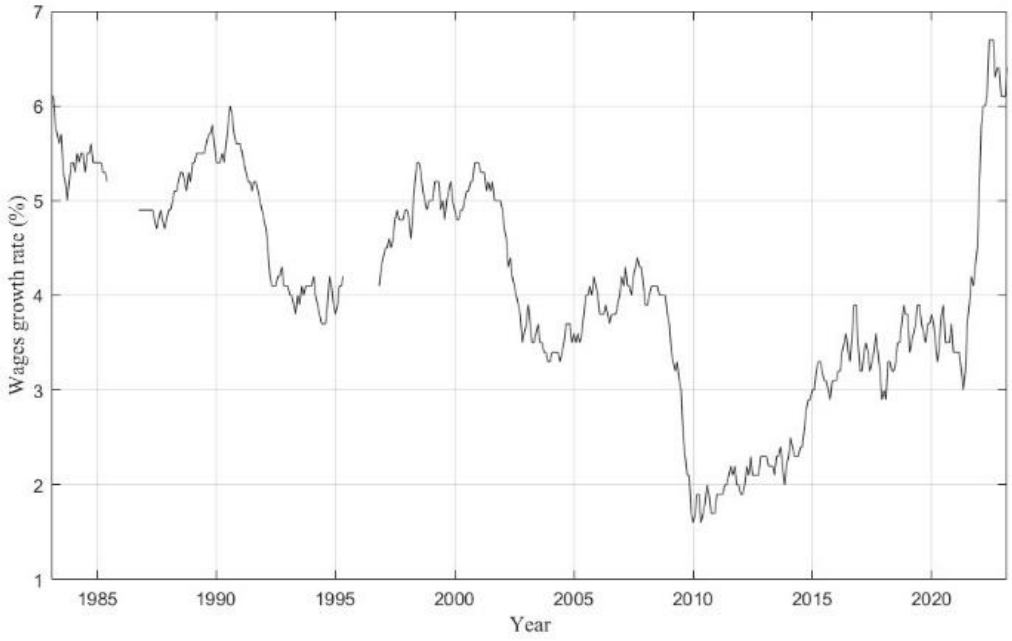
Appendix A: U.S. Leading Economic Index performance over 40 years



Appendix B: U.S. Unemployment rate in percent over 40 years



Appendix C: U.S. G.D.P Growth annual rate in percent over 40 years



Appendix D: U.S Wages growth rate in percent over 40 years